WHEREAS, the California Regional Water Quality Control Board, Central Valley Region ("Central Valley Water Board" or "Board") finds that:

1. Jurisdiction: The Wide Awake Mercury Mine property and the Central, Cherry Hill, Empire, Manzanita and West End Mine properties (the "Central Mine Group") (collectively "the Properties") are located in Colusa County, California. The Properties are more particularly described in Attachment B, legal descriptions and map. The Central Valley Water Board has alleged that mining wastes containing mercury compounds have been eroding from the Properties and discharging into waters of the State, creating a condition of pollution or nuisance. The Central Valley Water Board is the lead agency for site cleanup at the Properties.

2. Site Status: On November 13, 2009, a panel of the Central Valley Water Board held a public hearing to receive evidence regarding alleged water quality impairments at the Properties, and subsequently issued a recommendation to the full Board. Following that recommendation, the Central Valley Water Board on May 27, 2010, held a further public hearing and, under the authority of Water Code section 13267, issued Technical and Monitoring Report Orders R5-2010-0048 and R5-2010-0049 (the "Orders"), which require further study of water quality concerns at the Properties. The Orders name several entities as Designated Persons and Dischargers, including Homestake Mining Company of California ("Homestake"). On June 28, 2010, Homestake filed timely petitions with the State Water Resources Control Board ("State Water Board") for review of the Orders, and requested that the petitions be held in abeyance to allow for completion of settlement discussions with the involvement of the Executive Director of the Central Valley Water Board. On July 2, 2010, the State Water Board granted the request, and agreed to hold the petitions in abeyance until at least December 31, 2010. On November 30, 2010, the State Water Board granted a request to continue that abeyance until June 30, 2011.

3. Homestake and the Central Valley Water Board’s Prosecution Team (consisting of members of the Central Valley Water Board that are pursuing cleanup of the Properties) have presented a proposed settlement to the Central Valley Water Board for its approval. While the settlement does not contain any admission of liability by
Homestake, pursuant to the terms of the settlement agreement, Homestake will carry out certain remedial activities at the Properties for the Central Valley Water Board in exchange for a mutual release and covenant not to sue for investigation and cleanup of contamination at or from the Properties, such activities being carried out by Homestake at the Board’s direction and under its supervision to assist the Board in its responsibility to address conditions of pollution or nuisance. (Attachment A). Entering into a Mutual Release and Covenant Not to Sue with Homestake will facilitate work related to cleanup of the Properties.

4. **Board Authority**: Pursuant to Water Code section 13300 et seq., the Central Valley Water Board has authority to release and covenant not to sue or assert claims for environmental investigation or remediation or other related claims against potentially responsible parties if such agreements are sufficiently in the public interest to warrant expending the public resources necessary to reach such agreement.

5. The *Water Quality Control Plan for the Sacramento River and San Joaquin River Basins*, Fourth Edition, revised September 2009 (the “Basin Plan”) contains an implementation program designed to guide the remediation of past and existing discharges of mercury-laden sediment to the Cache Creek Watershed (the “Cache Creek Mercury Program”). The remedial activities that Homestake has agreed to undertake in exchange for a mutual release and covenant not to sue are essential components of the Cache Creek Mercury Program. However, the remedial activities proposed by Homestake will not complete the environmental remediation actions required by the Basin Plan; additional responsible parties will be pursued by the Board to accomplish the remaining obligations. The following is a list of the actions required by the Basin Plan’s Cache Creek Mercury Program that have yet to be implemented at the Properties:

   a. Reduce loads of total mercury from inactive mines;
   
   b. Where feasible, implement projects to reduce total mercury inputs from mercury-containing sediment deposits in creek channels and creek banks downstream from historic mine discharges;
   
   c. Reduce erosion of soils with enriched total mercury concentrations;
   
   d. Limit activities in the watershed that will increase methylmercury discharges to the creeks and, where feasible, reduce discharges of methylmercury from existing sources; and
   
   e. Evaluate other remediation actions that are not directly linked to activities of a discharger.

Homestake’s proposed remedial actions are designed to implement required actions a., c. and d., above, by removing a significant source of eroding mercury-enriched soil that was created during historic mining operations.
6. The stated goal of the Basin Plan’s Cache Creek Mercury Program, as far as the inactive mines are concerned, is to, “…restore the mines to pre-mining conditions with respect to the discharge of mercury.” Homestake’s proposed remedial actions will further this goal.

7. Although the Basin Plan recognizes that “[m]ethylmercury allocations will be achieved in part by natural erosion processes that remove mercury that has deposited in creek beds and banks since the start of mining,” additional actions will be required of other responsible parties to remediate mercury and methylmercury impacts in the Cache Creek watershed. As stated in Table IV-6.3 of the Basin Plan, those other responsible parties have responsibility for implementation of supplemental activities with respect to addressing methylmercury, including:

a. Cleanup mines, sediment, and wetlands in Bear Creek, Harley Gulch, and Sulphur Creek:¹ mine owners and other responsible parties, United States Bureau of Land Management (“BLM”).

b. Conduct additional studies, submit engineering reports, and conduct projects designed to remove or minimize the impact of mercury-enriched sediment in the Harley Gulch Delta: BLM.

c. Conduct studies to explore the feasibility of remediating in-creek and in-floodplain sediments in the Upper Cache Creek watershed: BLM, State Lands Commission, Colusa, Lake and Yolo Counties, and private landowners.

d. Conduct studies and develop, submit, and implement erosion control plans to prevent the discharge of “enriched” mercury sediments from entering the Cache Creek upper watershed: BLM, State Lands Commission, Colusa, Lake and Yolo Counties, and private landowners.

e. Implement management practices and monitoring for erosion control from new projects in the 10-year floodplain: Yolo County, Reclamation Board, private landowners, and the US Army Corps of Engineers.

f. Submit plans to control methylmercury discharges from new reservoirs, ponds, and wetlands in the Cache Creek watershed: Yolo County or project proponents.

The mutual release and covenant not to sue that will be provided by the Central Valley Water Board for the Properties in exchange for Homestake’s implementation of the proposed remedial activities exempt Homestake from any additional obligations related to any of the above implementation provisions or any of the required implementation measures recited in Finding No. 5.

¹ The Central Valley Water Board’s Prosecution has alleged that Homestake is one of the parties for undertaking these actions. The Mutual Release and Covenant Not to Sue will release Homestake from all of these alleged obligations upon implementation of the proposed workplan.
8. **CEQA:** The granting of a Covenant Not to Sue does not constitute a “project” as defined by Public Resources Code section 21065 and California Code of Regulations, title 14, section 15378(a). Thus, this action is exempt from the provisions of the California Environmental Quality Act (Pub. Resources Code § 21000 et seq.).

9. **Public Notice:** The Board provided notice of its intention to consider this matter at the April 6/7/8, 2011, Central Valley Water Board meeting and provided an opportunity for interested persons, including all Designated Persons and Dischargers at the Properties, to comment on the draft resolution and its attachments.

10. **Public Hearing:** The Central Valley Water Board, at a public meeting, heard and considered all comments pertaining to the alleged discharges at or from the Properties.

**NOW, THEREFORE BE IT RESOLVED,** that the Central Valley Water Board, having considered the facts regarding the water quality concerns and the involvement of Homestake at the Properties, and having considered the terms of the proposed settlement, after notice to and full opportunity to be heard for all affected parties, including all Designated Persons and Dischargers, finds that the proposed agreement, release and covenant not to sue are in the public interest, and authorizes the Executive Officer to negotiate minor amendments to the draft Mutual Release and Covenant Not to Sue (Attachment A) and to sign and execute the Mutual Release and Covenant Not to Sue (Attachment A as amended) with Homestake Mining Company of California.

I, PAMELA C. CREEDON, Executive Officer, do hereby certify that the foregoing is a full, true and correct copy of a Resolution adopted by the California Regional Water Quality Control Board, Central Valley Region, on April 8, 2011.

________________________________________

PAMELA C. CREEDON, Executive Officer

Attachment A: Mutual Release and Covenant not to Sue
Attachment B: Property Description
Attachment C: Workplan
I. INTRODUCTION

THIS MUTUAL RELEASE AND COVENANT NOT TO SUE (the “Mutual Release”) is provided pursuant to Central Valley Regional Water Quality Control Board (“Central Valley Water Board” or “Board”) Resolution R5-2011-0020 (hereafter “Resolution”) authorizing its Executive Officer to negotiate and sign the Mutual Release concerning the Wide Awake Mercury Mine property and the Central, Cherry Hill, Empire, Manzanita and West End Mine properties (the “Central Mine Group”) (collectively “the Properties”), which are more particularly described in Attachment B to the Resolution.

Pursuant to Water Code section 13267, the Central Valley Water Board has issued Technical and Monitoring Report Orders R5-2010-0048 and R5-2010-0049, which direct Homestake Mining Company of California (“Homestake”) and other parties to undertake investigative actions at the Properties. Homestake has denied having liability for investigation and cleanup activities at the Properties, and has filed a timely petition for review of these Orders with the State Water Board. The Central Valley Water Board understands that Homestake has agreed to undertake, at the direction and under the oversight of the Central Valley Water Board, remedial actions at the Properties. Although it is the position of the Central Valley Water Board that it is precluded from apportioning liability for investigation and cleanup activities in Board-issued Orders, the Board hereby recognizes that the scope of the actions that Homestake has agreed to undertake is estimated to be greater than its proportional share, if proportionality was determined on the basis of the time that Homestake was involved with the Properties and the scope of Homestake’s activities at the Properties. Homestake desires a commitment, to the maximum extent permitted by law, that it, as well as all of its directors, officers, employees, partners, affiliates, and agents, (individually “Homestake” or “Released Party” and collectively the “Released Parties”) will not be subject to any further liability for, or the subject of any actions, claims, orders, demands, enforcement actions or other civil or administrative proceedings, including without limitation, any investigation, monitoring or remediation requirements, related to or arising from the Known Conditions as of the date this Mutual Release is fully executed (“Effective Date”).
II. DEFINITIONS

For purposes of this Mutual Release, “Known Conditions” means all conditions of pollution or nuisance at, under, or originating from the Properties or any portion thereof, that was known to the Central Valley Water Board prior to the Effective Date. The term “known to the Central Valley Water Board” means all information regarding the pollution or nuisance at, under, or originating from the Property, or any portion thereof, that was disclosed to the Central Valley Water Board, or that is reasonably discernible from the reports listed in Orders R5-2010-0048 and R5-2010-0049, the Resolution, or the investigations, work plans, reports, or any other information submitted to the Central Valley Water Board by any party prior to the Effective Date.

III. FINDINGS OF FACT

This Mutual Release is based on the findings made by the Central Valley Water Board in Resolution R5-2011-0020, and on the following findings by Board staff:

1. The Properties are within the jurisdiction of the Central Valley Water Board due to the Known Conditions and are subject to the provisions of Central Valley Water Board Orders R5-2010-0048 and R5-2010-0049 (the “Orders”). The Central Valley Water Board enters into this Mutual Release pursuant to California Water Code sections 13000 et seq. The Central Valley Water Board has authority to release and covenant not to sue or assert claims for environmental investigation or remediation or other related claims against potentially responsible dischargers at environmentally-impacted properties, where, as here, the agreement is sufficiently in the public interest.

2. It is not disputed that mining-related discharges at the Properties are primarily the result of historical mining operations on the Properties, which ended almost entirely by the early 1940’s, except for mining in Central Mine Group in the early 1970’s undertaken by Bailey Minerals Corp. The Board contends that limited waste material was also generated by exploratory actions, including geothermal exploration activities unrelated to Homestake, which occurred in the 1970s and 1980s. There is no active mining at any of the Properties, and the mining activity that created the majority of the mining waste that has been eroding into waters of the State occurred almost exclusively prior to the early 1970’s.

3. With respect to the involvement of Homestake at the Properties, it is not disputed that:

   a. Homestake is not a current owner or operator at either of the Properties, and has not been involved at either of the Properties for at least ten years;

   b. Homestake never operated a mine at either of the Properties;
c. Homestake had a lease allowing it to carry out limited exploration and development activities at the Wide Awake Mine from 1978-1992, and held a fee interest in portions of the Central Mine Group properties from 1978-1999, and a lease allowing limited exploration and development activities at other portions of the Central Group Mines from 1978-1993; and

d. Homestake’s exploration activities at both of the Properties were reviewed prior to implementation with respect to their potential for environmental impacts on water quality and approved by Colusa County and the Central Valley Water Board.

4. The Board asserts that Homestake, as an owner in fee or lessee of the properties, is liable under the California Water Code as a “passive discharger” for releases of mercury from the Properties, based on its failure to prevent discharges from mining wastes to waters of the State that may have occurred during the period of its involvement with the Properties.

5. Homestake denies that any activities it engaged in at the Properties resulted in the discharge of mercury from mining wastes to waters of the State, and denies that it would have liability as a “passive discharger” under California Water Code sections 13267, 13350, and 13304. Homestake also denies that, as a holder of exploration leases that did not provide exclusive control of the leased properties, it would be liable, even under the “passive discharger” liability claims asserted by the Board, for any releases of mercury to waters of the State from the Wide Awake Mine and those parcels at the Central Mine Group not held by Homestake in fee.

6. Homestake further asserts that any harm resulting from discharges to waters of the State for which it may be liable is reasonably divisible by term of ownership, and nature of activities on the Properties, and that its divisible share, if any, would be at worst a small percentage of the cost of investigation required by the Orders, and of any subsequent remediation required.

7. Given the nature of Homestake’s involvement with the Properties, the Board agrees that the value of the Homestake’s commitment under this agreement represents significantly more than Homestake’s proportionate share of liability for any contamination at the Properties, should the Board be able to establish Homestake’s liability for site investigation and cleanup under the California Water Code and if the Board had the ability to apportion liability between the parties formerly and currently involved at the Properties.

8. The proposed settlement represents a good faith resolution of the liability of Homestake to the Central Valley Water Board under the applicable provisions of State, federal and common law, including Water Code sections 13267, 13304, and 13350, for any condition of pollution or nuisance arising at or originating from the Properties.
9. By entering into this Mutual Release, Homestake certifies that, to the best of its knowledge and belief, it has fully and accurately disclosed to the Central Valley Water Board any and all information known to Homestake and all information in the possession or control of its officers, directors, employees, contractors and agents which relates in any way to any existing condition of pollution or nuisance, or any past or potential future release of hazardous substances, arising at or originating from the Properties.

10. This Mutual Release is consistent with the goals and purposes of the Porter-Cologne Water Quality Control Act (Water Code § 13000 et seq.).

IV. MUTUAL RELEASE AND COVENANT

1. In accordance with Resolution R5-2011-0020, and as recommended by the Board’s Prosecution Team and Executive Officer, the Central Valley Water Board expressly finds that the Released Parties shall not be liable or otherwise responsible for such Known Conditions and hereby covenants and agrees not to initiate, bring, or support any claim, order, demand, enforcement action or other civil or administrative proceeding against the Released Parties arising out of or related to such Known Conditions under any local, state or federal statute or the common law, including but not limited to, in their entirety, the United States Code, including the Comprehensive Environmental Response, Compensation and Liability Act (“CERCLA”), the various California Codes, or other applicable laws, regulations, ordinances, or civil, judicial or administrative authorities, having application to the handling, release, presence, migration, cleanup, containment or maintenance of the Known Conditions at, on, under or originating from the Properties, or any portion thereof.

2. In partial consideration for this Mutual Release, the Released Parties promise to carry out on behalf of the Board the remediation as described in the Work Plan to address mining-related materials in the areas of the Properties upland of Sulphur Creek, and to reimburse the Regional Board for its oversight of the implementation of the Work Plan. In addition, the Released Parties agree to pay into an escrow established by the Board, the sum of $50,000 to be used at the direction and in the discretion of the Board for investigative work not included in the Work Plan and to be carried out by the Board or third parties, to identify the potential for impacts to the waters of the State from mercury-bearing mining-related materials in Sulphur Creek. In further consideration for this Mutual Release, the Released Parties hereby release and covenant not to sue the Central Valley Water Board, its authorized officers, employees or representatives, with respect to any and all liability or claims associated with or arising out of the Known Conditions.

administrative or judicially approved settlement shall not be liable for claims for contribution regarding matters addressed in the settlement.” Accordingly, the Central Valley Water Board affirms that this Mutual Release and Covenant Not to Sue resolves the Released Parties’ liability to the Central Valley Water Board with regard to any claims related to the matters included in the Order and Resolution R5-2011-0020, including all claims regarding the handling, storage, presence, migration, cleanup, or disposal of the Known Conditions at, under, or originating from the Property, and that the Released Parties are entitled to protection against claims for contribution by any other parties to the extent authorized by state, federal or common law for all matters covered under the proposed settlement, including California Civil Code section 877 and 42 U.S.C. § 9613(f)(2).

4. Homestake’s obligation under this agreement is to perform on behalf of the Board, and at the direction of and under the supervision of the Board, the work described in the attached Work Plan as arranged by the Board, through its own workforce or through contractors it has retained, subject to a dollar cap of $2,172,014 (including costs incurred to date by Homestake for permitting and engineering work in connection with implementation of the Work Plan). Should Homestake be unable to carry out any of the work described in the Work Plan for reasons beyond its control, such as to the failure or refusal of the current owners of the properties to allow the work to go forward, Homestake may pay to the Board, or to a trust with the Board as the named beneficiary, the estimated cost of the work that cannot be completed, including the estimated oversight costs of the Board, except that in no event shall Homestake be required to pay a total amount in costs for work described in the Work Plan that exceeds the dollar cap in this agreement.

5. The Board will not seek to hold Homestake liable or otherwise responsible for any additional work outside of the Work Plan relating to contamination at or from the Properties. Homestake’s obligations under the scope of work in the Work Plan will not include post-completion operation and maintenance with respect to any portion of the Properties, including any portion of the Properties that may be used for the disposal or relocation of materials, or maintenance of any constructed feature such as caps or retaining or diversion structures.

6. This Release shall be without prejudice to the ability of the Central Valley Water Board to take action against any party other than the Released Parties, relating to the investigation, cleanup, or cost of investigation or cleanup of the Known Conditions.

7. Notwithstanding any other provisions of this Mutual Release, the Central Valley Water Board reserves the right to assert any claims, enforcement actions or other civil or administrative proceedings against the respective Released Parties relating to the acts or omissions of the Released Parties arising after the Effective Date and which are based on the failure of the respective Released Parties, to the extent they have control over the Property, to (i) comply with the requirements and
8. This Mutual Release may be executed in one or more counterparts, each such counterpart being deemed an original but all counterparts constituting a single instrument.

9. Each of the undersigned parties hereby certifies, and warrants that he or she is authorized to bind his or her agency or entity to the continuing obligations described herein, and that the foregoing is a full, true and correct copy of Attachment A to Resolution R5-2011-0020, Mutual Release and Covenant Not To Sue adopted by the California Regional Water Quality Control Board, Central Valley Region, on 8 April 2011.

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION
By: ________________________________
Date: ______________________________

HOMESTAKE MINING COMPANY OF CALIFORNIA
By: ________________________________
Title: ______________________________
Date: ______________________________
Attachment B
Location Map
Central, Cherry Hill, Empire
Manzanita, West End and Wide Awake Mines

(Legal Description on next page)
Legal Description:

Colusa County Assessor’s Parcel Numbers 018-200-010-000, 018-200-11-000, and 018-200-12-000 in Sections 28 and 29, Township 14 North, Range 5 West, Mount Diablo Base and Meridian (MDBM) describe the Wide Awake Mercury Mine.

Colusa County Assessor’s Parcel Numbers 018-200-002-000, 018-200-013-000, 018-200-014-000, 018-200-015-000, 018-200-016-000, 018-200-017-000, 018-200-018-000, 018-200-004-000, 018-200-005-000, and 018-200-007-000, in Sections 28 and 29, Township 14 North, Range 5 West, Mount Diablo Base and Meridian (MDBM) describe the Central, Cherry Hill, Empire, Manzanita and West End Mines.
Mining-Related Materials Characterization and Remediation Work Plan

Submitted to:
Regional Water Quality Control Board – Central Valley Region
11020 Sun Center Drive, Suite 200
Rancho Cordova, CA 95670-6114

Sulphur Creek Mining District
Central Group and Wide Awake Mines
Colusa County, California

September 2010

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Delivering sustainable solutions in a more competitive world
Mining-Related Materials Characterization and Remediation Work Plan

Sulphur Creek Mining District
Central Group and Wide Awake Mines
Colusa County, California

September 2010

Project No. 116443.03

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I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my knowledge and on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Jim Warner
Printed Name of Registered Professional Geologist

____________________________
Signature

5314
Registration Number

California
State

30 September 2010
Date

Professional Geologist’s Seal
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LIST OF ACRONYMS

BMP  Best Management Practice
°C  degree Celsius
CalWET  California Waste Extraction Test
CEQA  California Environmental Quality Act
CNDDB  California Department of Fish and Game Natural Diversity Database
CSM  conceptual site model
CVRWQCB  Central Valley Regional Water Quality Control Board
cy  cubic yard
District  Sulphur Creek Mining District
EE/CA  Engineering Evaluation and Cost Analysis
ERM  Environmental Resources Management / ERM-West, Inc.
°F  degree Fahrenheit
GPS  global positioning system
HASP  Health and Safety Plan
Homestake  Homestake Mining Company of California
mg/kg  milligrams per kilogram
Orders  Technical and Monitoring Report Orders R5-2010-0048 and R5-2010-0049
RCRA  Resource Conservation and Recovery Act
RUSLE2  Revised Universal Soil Loss Equation
SAP  Sampling and Analysis Plan
STLC  Soluble Threshold Limit Concentration
Site  Wide Awake Mine and mines within the Central Mine Group
SWPPP  Storm Water Pollution Prevention Plan
TMDL  Total Maximum Daily Load
U.S.  United States
USBM  United States Bureau of Mines
USEPA  United States Environmental Protection Agency
USGS  United States Geological Survey
Work Plan  Mining-Related Materials Removal Work Plan for the Wide Awake Mine and Mines within the Central Mine Group
1.0 INTRODUCTION

On 27 May 2010, the Central Valley Regional Water Quality Control Board (CVRWQCB) issued Technical and Monitoring Report Orders R5-2010-0048 and R5-2010-0049 (Orders), which require the submittal of a Mining Waste Characterization Work Plan (Characterization Plan) and a Mining Waste Characterization Report (Characterization Report) for the Wide Awake Mine and five mines within the Central Mine Group (Central, Cherry Hill, Empire, Manzanita, and West End). The Orders were issued by the CVRWQCB based on provisions of California Water Code Section 13267. The six mines addressed by the Orders are located within the Sulphur Creek Mining District (the District), and for purposes of this document, these six mines, including adjacent land, are collectively referred to as “the Site”.

The Orders were issued to several Potentially Responsible Parties, including Homestake Mining Company of California (Homestake), which are referred to as Dischargers in the Orders. The CVRWQCB has recognized that Homestake did not engage in any of the mining activities that resulted in the mining materials that are being addressed by the Orders.

ERM-West, Inc. (ERM) has prepared this Mining-Related Materials Characterization and Remediation Work Plan (Work Plan), on behalf of Homestake, to describe the following:

• Site background;
• Characterization of the mining-related materials to be removed;
• A proposed mining-related materials removal scope of work;
• The removal design, methods, and procedures; and
• Proposed schedule.

The CVRWQCB has acknowledged that this Work Plan meets Homestake’s requirements for both the Characterization Plan and Characterization Report required under the Orders (CVRWQCB, 2010a).

---

1 The Site includes a cumulative area of about 465 acres within the Sulphur Creek watershed in Colusa County, and is located in Sections 28 and 29, Township 14 North, Range 5 West, Mount Diablo Base and Meridian. The specific parcel numbers included within the Site are listed on the Orders.
Although the Orders include additional characterization and reporting requirements, the CVRWQCB agreed that Homestake’s obligation is limited to the remediation of the surface mining-related materials. Additional characterization actions, if required, and other inspection and maintenance activities after Year 1 (e.g., constructed erosion control measures and revegetation plan) shall be the responsibility of other Dischargers identified by CVRWQCB. Post Year 1 inspection and maintenance activities are proposed in this Work Plan; however, final plans would be agreed upon by CVRWQCB and identified Dischargers.

1.1 PROJECT OBJECTIVES

The objective of the removal activities described in this Work Plan is to mitigate the migration of particulate material potentially containing mercury from mining-related materials (e.g., waste rock, tailings, and mining equipment) associated with the Site that are potential sources of mercury to Sulphur Creek. This would be accomplished by removing mining-related equipment where necessary and removal and/or stabilizing other mining-related materials (i.e., waste rock, tailings, stockpiled ore, and shallow mercury-enriched soils) that are present in the vicinity of former mercury processing areas (retorts, furnaces, kilns). During execution of the reclamation activities, environmental and health and safety controls would be implemented to ensure the work is completed safely and in accordance with applicable federal, state, and local regulations and permit conditions.

1.2 GENERAL PROJECT APPROACH

The project, as outlined, includes planning, design, permitting, bid specifications, contractor selection, and oversight services during the project development, construction, and post-construction phases. The following summarizes the general approach to each of the project phases and the controls that would be implemented to ensure the work is completed safely and in accordance with applicable federal, state, and local regulations and permit conditions:

- Project Development and Scoping – During this phase, the project will be defined based on the identified objectives and schedule constraints. Applicable county, state and federal approvals will be attained, bid specifications will be prepared, and the construction contractor selected so construction may be initiated in Spring 2011. The implementing parties would work closely with the CVRWQCB, and
other regulatory agencies, as needed, to comply with applicable environmental requirements; and identify sustainable business practices that can be integrated into the removal design and implementation. Support from the CVRWQCB through the permitting process to ensure that applications and permits are received in a timely manner will be critical to the overall project success.

• Construction – The construction phase will include site preparation; removal and/or stabilization of mining-related waste rock, tailings, and stockpiled ore; removal of mining-related equipment (if required) and shallow mercury-enriched soils that may be present in the vicinity of former retort or furnace areas; material transportation and disposal; and grading and reclamation. During the construction phase, a record of approvals and permit conditions will be created and maintained in a single “Permit Book”, including all certified and signed permissions and exemptions and a complete list of permit conditions and best management practices (BMPs) that are to be adhered to during construction. In addition, clear lines of communication and project responsibilities will be defined for each construction activity prior to the start of construction. Following completion of removal activities, compliance with permit conditions and requirements will be documented, and the Site will be restored and re-vegetated in working areas, as needed, and a final inspection by CVRWQCB will be scheduled.

• As stated in the Orders, “the issuance of the Orders is an enforcement action taken by a regulatory agency and is exempt from the provisions of the California Environmental Quality Act (CEQA) Pub. Resources Code, section 21000 et seq.), pursuant to California Code of Regulations, Title 14, section 15321(a)(2). The implementation of this Order is also an action to assure the restoration of natural resources and/or the environment and, as currently contemplated, may be exempt from the provisions of the CEQA, in accordance with California Code of Regulations, title 14 sections 15307 and 15308.

Detailed descriptions of the removal scope of work and the removal design, methods, and procedures are provided in Sections 3 and 4 of this Work Plan, including the environmental, health and safety controls to be implemented during the project. However, the plans will require input and concurrence from property owners and other named Dischargers; thus, final detailed plans and cost estimates will be provided when available.
1.3 WORK PLAN ORGANIZATION

This Work Plan is organized as follows:

- Section 2 provides background information related to the Site, including an overview of the setting, history and development, environmental conditions, and characterization of mining-related materials that provide the basis for the remediation and removal actions.

- Section 3 provides the approach and scope of work of the mining-related material remediation actions.

- Section 4 provides detailed descriptions of the remediation design, methods, and procedures.

- Section 5 discusses the proposed project schedule.

- Section 6 provides a list of the literature cited in the Work Plan.
2.0  BACKGROUND

This section summarizes Site background information relevant to the planned mining-material reclamation activities, including the Site setting, history and development, environmental conditions and characterization of mining-related materials.

2.1  SITE SETTING

This section provides an overview of the Site location and features, geology and soils, hydrogeology, hydrology, climate, vegetation and wildlife, land use and ownership, and potentially significant historical and archaeological features. A Site location map is provided as Figure 2-1.

2.1.1  Site Location and Features

The District encompasses an area of about 22 square miles in the eastern portion of the Coast Range geomorphic province of California, about 8 miles west of the western margin of California’s central valley and approximately 20 miles west of Williams, California (Figure 2-1). The Coast Range geomorphic province consists of northwest trending ridges between the Pacific Ocean and California’s central valley. This portion of the Coast Range is dominated by moderately steep to steep slopes and summits with steep narrow valleys.

The District includes the 6,543-acre Sulphur Creek watershed and adjoining portions of the Bear Creek watershed to the north and the Harley Gulch watershed to the south. These watersheds are components of the larger, 1,095-square-mile, Cache Creek watershed that drains into the Yolo Bypass (Figure 2-2). The Site includes a cumulative area of about 465 acres within the Sulphur Creek watershed in Colusa County, and is located in Sections 28 and 29, Township 14 North, Range 5 West, Mount Diablo Base and Meridian. The Site ranges in elevation between 1,400 to 1,640 feet above mean sea level.

Several of the individual mine areas within and outside the Site are located adjacent to Sulphur Creek. Sulphur Creek is an intermittent stream with continuous flows reported between the fall and spring months (October through June). Stretches of the stream are wet throughout the year due to inputs from geothermal springs (CVRWQCB, 2007).
A Site map, showing the approximate locations of the mines and mining-related features is provided as Figure 2-3. In general, the six mines constituting the Site include one or more of the following mining-related material types:

- Calcined tailings (the relatively fine-grained waste material remaining after the ore is processed in a furnace or retort);
- Waste rock (relatively coarse-grained rock fragments generated while excavating to gain access to ore in the subsurface);
- Mining-related mercury-enriched soils\(^2\) located adjacent to former retorts, kilns or furnaces;
- Ore, including rock fragments or sediment containing one or more minerals in sufficient concentrations and quantities for economic recovery;
- Miscellaneous small waste piles, including materials of varied and/or uncertain origin; and
- Mining equipment and structures, including remnants of former furnaces, retorts, and other mining and milling equipment.

A detailed inventory and description of the mining-related materials present at the Site is provided in Section 2.4

### 2.1.2 Geology and Soils

The Sulphur Creek watershed is located in the northern California Coast Range near the Coast Range Thrust Fault. The Coast Range Thrust pushed a thick sheet of mostly sedimentary rocks (the Great Valley sequence) over the metamorphic rocks of the Franciscan complex. Numerous faults underlie the area surrounding Sulphur Creek. The eastern edge of the Stony Creek Thrust is slightly north of Sulphur Creek. The western end of the Resort Fault Zone is located within the Sulphur Creek watershed. Common lithologies in the area include detrital serpentines, sandstone, and mudstone. Mercury-gold mineralization is associated with splays of the Stony Creek Thrust Fault. A geological map of the Site is provided as Figure 2-4.

The Wilbur Springs Hydrothermal Area, which encompasses portions of the Sulphur Creek Watershed, is known for its thermal springs and is associated with the District hydrothermal ore deposits, most notably

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\(^2\) Adjacent to retorts or furnaces and generally up to 1 foot deep.
mercury and gold. The Wilbur Springs Hydrothermal Area is terminated west of the West End Mine and east of the Central Mine by faults. Local concentrated fractures in the Site, particularly those associated with cross-cutting structures, have focused increased hydrothermal convection and mineralization from a heat source beneath the area.

Thermal-spring-type mercury deposits are associated closely with volcanic host rocks and associated clastic sedimentary rocks and form in the near surface environment (Rytuba, 2002). The mercury was deposited as cinnabar, derived when mercury vapor from sedimentary rocks reacted with hydrogen sulfide. In areas where mercury vapor was not trapped underground, the serpentine-derived soils contain only small concentrations of mercury.

2.1.3 Hydrogeology

There are no water wells reported within 1 mile of the District according to the California Department of Water Resources Database (CVRWQCB, 2007); therefore, little information is available pertaining to the District hydrogeology. Groundwater beneath the District is primarily geothermal. The source of these hot springs is a deep-seated fracture system that exposes groundwater to heat sources, such as a magma chamber, which produces the natural hydrothermal, mineralizing fluids. A shallow magma chamber beneath the Geysers-Clear Lake area is the most likely source of geothermal activity and springs in the Sulphur Creek watershed. The United States (U.S.) Geological Survey (USGS) has mapped numerous mercury-bearing geothermal springs discharging to Sulphur Creek, including the Jones Fountain of Life, Blanck Springs, Elbow Springs, Elgin Spring, and the Wilbur Hot Springs. All the identified springs, except Elgin Spring, drain directly into lower Sulphur Creek. Many unnamed hydrothermal springs also emanate from the streambed of Sulphur Creek, including springs fed by base flow in stream gravels adjacent to the West End Mine (Tetra Tech, 2003). Figure 2-5 shows the locations of geothermal springs in the area.

2.1.4 Hydrology

The District lies within the 1,095 square mile Cache Creek watershed (Figure 2-2). Summer flows in Cache Creek are controlled by releases from the Indian Valley Reservoir and Clear Lake for irrigation. Releases from Clear Lake and Indian Valley Reservoir are curtailed during the winter months to increase storage, and winter flows in Cache Creek are controlled by runoff from precipitation. Cache Creek flows into the Sacramento River, a major tributary to the Bay-Delta.
The upper Cache Creek basin is naturally divided into three sub-basins: Main stem (Cache Creek), North Fork (Cache Creek), and Bear Creek. Intermittent creeks located within the Site periodically contribute flow to Sulphur Creek, which drains a 10-square-mile area and flows into Bear Creek (Figure 2-2). Sulphur Creek has an average base flow in the summer of about 0.3 cubic feet per second, predominantly from mercury-bearing springs. Peak flows of up to 81 cubic feet per second were recorded for Sulphur Creek in February 1963 (USGS, 2002).

Although the primary objective of the remediation effort is to control erosion and minimize the sediment load delivered to the Sulphur Creek channel, the remediation program is not a stream restoration effort. However, it should be noted that Sulphur Creek is subject to natural structural changes over time that is completely unrelated to the mining-related materials in the valley and the existing Sulphur Creek channel is experiencing considerable instability. A brief description of the observed instability provided by Mr. Ken Myers, P.E. of the Mines Group is included in Sulphur Creek Instability Photo Log, Appendix A.

2.1.5 Climate

The average temperatures within the District range from approximately 41°F (degrees Fahrenheit) / 5.1°C (degrees Celsius) to 72.4°F / 22.4°C (Tetra Tech, 2003). The District receives an average of approximately 27 inches (68.6 centimeters) of precipitation each year. Most of the precipitation is rain, but an occasional snowstorm occurs during the winter months. The majority of the rain falls between November and March (Tetra Tech, 2003).

2.1.6 Vegetation and Wildlife

As described in the Engineering Evaluation and Cost Analysis for the Sulphur Creek Mining District (EE/CA – Tetra Tech, 2003), vegetation in the District consists of an interior live oak plant community characterized by shrub oak, interior live oak, chaparral, manzanita, forbs, shrubs, and grasses. In general, the mining areas within the Site are sparsely vegetated with non-native, invasive plants present in disturbed areas. The District is habitat for elk, mule deer, coyotes, rodents, raptors, and mountain lion.

An inventory of plant and wildlife species of special concern has not been compiled for the District; however, the California Department of Fish and Game Natural Diversity Database (CNDDB) was reviewed for the District and surrounding areas in March 2010. The CNDDB findings for the project area and greater Sulphur Creek region are summarized in Table 2-
1. The National Wetlands Inventory map for the Site was also reviewed for potential wetlands locations. The National Wetlands Inventory and CNDDB findings map for the project area is provided as Figure 2-6.

Based on the CNDDB findings, there are no state or federally listed threatened or endangered species within the Site area. However, there are BLM, State and other sensitive species. In addition the following two state rare, endangered or threatened plant species are listed as being within the project area, but not necessarily within the actual project footprint:

- Cobb Mountain lupine, and
- Big-Scale balsamroot.

Additional information has been gathered for the Site, such as delineations of wetlands for the project area, for incorporation, where appropriate, into project planning.

2.1.7 Land Use and Ownership

Land use within the District is predominantly rangeland in undeveloped chaparral and California scrub oak (Foe and Croyle, 1998). Cattle graze in portions of the lower watershed, with some recreation and fire-wood harvesting also occurring within the District (CalFED Report). The nearest community to the District is the town of Williams, located about 24 miles to the east, with a reported population of about 5,300 (City of Williams, 2009). The Wilbur Hot Springs resort, located on the north bank of Sulphur Creek about 1 mile east of the Central Mine, is the year-round home to about seven people (CVRQCB, 2007). There are no other known year-round residences in the watershed; however, two vacation homes are known to be located within the area.

Current land ownership within the Sulphur Creek watershed is shown on Figure 2-7. As shown on Figure 2-7, portions of the lower watershed are privately held by various land-owners. The U.S. Bureau of Land Management administers the public land in the upper portions of the watershed.

2.1.8 Potentially Significant Historical and Archeological Features

Properties of the District are currently not listed on the National Register of National Historic Landmarks. However, the mines were developed beginning in the 1800s, and portions of a number of original mining structures and equipment remain at the Site. In addition, Native Americans may have resided in or used the area prior to mining (CalFED
2.2 SITE HISTORY AND DEVELOPMENT

Mining and mining-related ore processing began in the District approximately 140 years ago, with numerous mines in the District reportedly developed for mercury and/or gold between the 1860s and 1870s. The principal inactive mines within the Sulphur Creek drainage that constitute the Site include the Wide Awake Mine and five mines within the Central Mine Group (Central, Empire, Cherry Hill, West End, and Manzanita). The approximate locations of these mines are shown on Figure 2-3, and available information related to their development histories and general current conditions are summarized in the following subsections. A more detailed mining-related materials inventory is provided in Section 2.4.

2.2.1 Wide Awake Mine

The Wide Awake Mine is located above the east side of an ephemeral tributary to Sulphur Creek (Figure 2-3). Other names used historically for the Wide Awake Mine include Wide Awake Consolidated, Buckeye, Buckeye Quicksilver, and Jefferson (CalFED Report). Originally known as the Buckeye mine, operations at the mine reportedly began in the 1870s, with an estimated total production in the 1870s of 1,800 flasks of mercury.

As described in CALFED – Cache Creek Study, Task 5C2: Final Report. Final Environmental Evaluation and Cost Analysis for the Sulphur Creek Mining District prepared by Tetra Tech EM, Inc., September 2003 (hereafter referred to as CalFED Report); the initial production at the Wide Awake mine was from shallow surface workings and tunnels. Later, 500-foot vertical shafts were sunk, with levels at 190, 290, and 390 feet. Limited production was also reported in the late 1890s, ending in about 1901. Some production may also have occurred in 1932 and 1943 (U.S. Bureau of Mines [USBM], 1965). Total production from the mine is estimated at about 1,800 flasks, most of which was produced in the 1870s.

Ore processing facilities in the 1870s included a Knox-Osborne 10-ton furnace and two small retorts (CalFED Report). In the early 1900s, a 24-ton Scott ore furnace was reportedly installed, but scarcely used before the mine ceased to operate. Currently, remains of the Knox-Osborne furnace and the two small retorts are present at the mine.
2.2.2 Central and Empire Mines

The Central and Empire mines included several historical mine openings. The Central Mine is the largest of the mines in the Central Mine Group and is located in the northern part of the Site (Figure 2-3). The Empire Mine is the easternmost mine of the Central Mine Group. Because their historical development and operations are intertwined, the development history and current conditions of these two mines are described together in this section.

Other historical names for the Central and Empire mines include Dewey, Little Giant, Mercury Queen, Mercury King, Hidden Treasure, the Mercury Mine, and the Sulphur Creek Mine (CalFED Report). The Empire Mine was located in the 1870s and the Central Mine in 1891. In 1873 the Empire mine reportedly produced 63 flasks of mercury (Watts, 1893b). No significant production occurred from the Central Mine until 1926, when about 107 flasks were reportedly produced (USBM, 1965). The mines were idle until 1942 when a small production was reported (USBM, 1965). Based on this information, it is estimated that the total production of mercury from the Central and Empire Mines was approximately 170 flasks.

Mine workings are reported to include several hundred feet of underground tunnels. The workings of the Central Mine consisted of four short adits, the highest about 400 feet above Sulphur Creek (CalFED Report). The Empire Mine may have included at least three adits that were up to 150 feet long (Moisseeff, 1966).

In 1873, ore from the Empire mine was processed in a small retort at the nearby Buckeye mine, which was later called the Wide Awake mine (Watts, 1893). During the 1890s, ore from the Central and Empire Mines was likely processed at the Abbott facilities (Bradley, 1918). In 1926, a small furnace was reportedly installed on the Central Mine, but was unsuccessful and the ore was processed via pipe retorts (Ransome and Kellog, 1939).

The workings of the Central and Empire Mines are now caved. There are no visible indications of the underground workings at the Central Mine; however, the remains of a former rotary furnace and brick retort are present below the former mine workings (CalFED Report).
2.2.3 Cherry Hill and West End Mines

The Cherry Hill Mine is located approximately 100 yards south of Sulphur Creek (Figure 2-3). The West End Mine is the westernmost mine in the Central Mining Group, and is situated in a bedrock promontory marking the western end of the steep slopes on the north bank of Sulphur Creek (Figure 2-3). Because the West End mine was likely operated in conjunction with the Cherry Hill Mine (Tetra Tech, 2003) their development history is described together in this section.

Gold was produced at both the Cherry Hill and West End mines. As described in CalFED Report, gold production records for the Cherry Hill mine are fragmentary. Gold production records are not available for West End mine, because this mine was likely operated in conjunction with Cherry Hill mine. There is no evidence that either mine produced mercury.

The Cherry Hill mine workings reportedly consist of two short adits that have a maximum length of about 100 feet, and the West End mine workings consist of three adits, the extent of which is unknown (CalFED Report). Ore processing facilities at the Cherry Hill mine consisted of a stamp mill with coarse gold recovery tables (Watts, 1893b). There is no reported processing operation at the West End Mine. West End ore was reported to be very siliceous and similar in milling quality to Cherry Hill ore and it is inferred that processing of West End ore was done in the Cherry Hill stamp mill (CalFED Report).

The mine workings at Cherry Hill are open and accessible. However, the adits were not observed to currently extend much further than a few yards into the rock and only various pieces of iron from the mill and concrete foundations were remaining in the vicinity of the mine. Two adits remain open at the West End Mine. Access is controlled to one of the adits with a gate, and the other is currently accessible.

2.2.4 Manzanita Mine

The Manzanita Mine is located adjacent to the north bank of Sulphur Creek (Figure 2-3). There are several mine workings included in the area currently known as the Manzanita Mine. The mine reportedly produced both gold and mercury, beginning in about 1863 until 1891, and is reported to have produced additional mercury from 1902 to 1942, yielding over 2,500 flasks (USBM, 1965). The mine workings included numerous tunnels and shafts, and mining was performed by using glory hole and open cut methods.
Processing was performed for gold, gold and mercury, and mercury alone. Ore was typically pulverized in a stamp mill, sized by gravity, and then passed over sluices to concentrate. The dried concentrates, mixed with lime, were then retorted (CalFED Report). A mine adit is evident above the outcropping on the western side of the Manzanita Mine. However, most of the tunnels and shafts at the mine are caved-in and inaccessible, and there are no remnants of mill structures. A concrete foundation that may have been part of a crushing facility and stamp battery is present to the west of the adit.

2.3 PREVIOUS INVESTIGATIONS AND CURRENT SITE CONDITIONS

Findings of the key investigations and evaluations of former mining activities within the District and related mercury loading to Sulphur Creek are summarized in the following subsections:

- Mercury studies in the Cache Creek watershed conducted in 2000 to 2001 (USGS, 2004);
- An assessment of the feasibility of remediating mercury mine sources in the Cache Creek watershed (Churchill and Clinkenbeard 2003);
- An EE/CA for the District (CalFED Report);
- The Sulphur Creek Total Maximum Daily Load (TMDL) for mercury (CVRWQCB, 2007); and
- Site Reconnaissance of Mine-Related Materials (ERM, 2009 and 2010).

2.3.1 Mercury Studies and Feasibility Assessment of Remediating Mercury Mine Sources in the Cache Creek Watershed, 2000 - 2003

An assessment of the potential ecological and human health impacts of mercury in the Cache Creek watershed was conducted in 2000 and 2001 with funding by the CALFED Bay-Delta Program. A number of federal and state agencies, universities, and one commercial laboratory contributed to the project, including the USGS, the U.S. Fish and Wildlife Service, the California Department of Fish and Game, the California CVRWQCB, the California Geological Survey, the University of California Davis, the San Jose State University Foundation, and Frontier Geosciences, Inc. The principal findings of the study and an assessment of the feasibility of remediating mercury mine sources in the District are presented in the Summary of Synthesis of Mercury Studies in the Cache Creek Watershed, California, 2000-01 (USGS, 2004) and in Task 5C1: Assessment of
the Feasibility of Remediation of Mercury Mine Sources in the Cache Creek Watershed (Churchill and Clinkenbeard, 2003).

The mercury studies were commissioned to:

- Evaluate and document the locations and potential remediation of mine wastes within the Cache Creek Watershed;
- To document the current loads of both total mercury and methylmercury to Cache Creek from major anthropogenic and natural sources;
- To test the potential for exporting sediment that contains mercury to transform to methylmercury in downstream environments; and
- To evaluate the factors controlling bioaccumulation of mercury in aquatic organisms within the Cache Creek watershed.

During the studies, fourteen historical mercury and gold mines in the District were evaluated to assess their potential mercury contributions to the Cache Creek watershed. During the field investigations, mining-related materials were inventoried and samples were collected for laboratory analysis. Mining-materials identified during the site evaluations included calcined tailings, waste rock, ore, miscellaneous small material piles, and processing-site soil (mercury-enriched soils located in the vicinity of former processing facilities, such as retorts). Naturally elevated mercury in soil resulting from weathering of hydrothermally mineralized bedrock was also observed at the mine sites. The mercury concentrations in these materials, including the naturally elevated mercury in soils, were reported to range from 10 to 300 milligrams per kilogram (mg/kg or parts per million). Ore piles and processing-site soils had higher mercury levels but were not observed at all the mines and were reported to be much less common and volumetrically less important than other materials that were naturally high in mercury (USGS, 2004). Occurrences of acid mine drainage were not observed at the Site during the mine-site investigations.

Previous studies found that mercury occurs principally in the form of cinnabar and metacinnabar in the ore and calcined tailings located in the District (Bradley, 1918; Rytuba, 1996). In the 2000-2001 USGS studies, leaching analyses with a reducing agent (hydroxylamine hydrochloride) were used to evaluate the mercury associated with iron and manganese oxides. The reductive leach analysis of selected samples found that only a very small percentage of the total mercury in ore, waste rock, calcined tailings, and naturally-elevated mercury soils was mobilized during leaching. These results were determined to be consistent with the
occurrence of mercury as cinnabar and metacinnabar, and suggest that most anthropogenic mercury moves from mine sites to adjacent waterways in particulate form rather than as dissolved mercury (USGS, 2004).

Additional mercury-speciation studies, using sequential-selected extraction experiments, were also conducted, and concluded that the mercury within the mining-materials are approximately 20 times less bioavailable for methylation than dissolved mercury, which is the form commonly produced by the geothermal springs (Churchill and Clinkenbeard, 2003). The study therefore concluded that solid-phase cinnabar-containing minerals do not represent a major methylation source to the main stem of Cache Creek.

Contributions of regional background mercury to Sulphur Creek were estimated to be 0.45 to 9.8 kilograms per year, assuming lower and upper annual erosion rates of 0.2 and 4 metric tons per hectare for each watershed (Churchill and Clinkenbeard, 2003). Identified non-mining mercury sources included:

- Thermal spring water and related precipitates;
- Eroded naturally-elevated mercury soil from mineralized areas;
- Eroded background mercury soil;
- Deposits of mercury-containing alluvium along creeks;
- Mercury emissions to the air from local naturally-elevated mercury soils in mineralized areas; and
- Atmospheric mercury from regional or global sources.

Based on the available information regarding the abundance and characteristics of mercury in mine site materials and estimates of mine site mercury contributions to waterways in the Sulphur Creek drainage, the USGS and CalFED reports concluded that effective mine site remediation should be based on general site erosion control and mining-related material isolation measures.

### 2.3.2 Engineering Evaluation and Cost Analysis for the Sulphur Creek Mining District, 2003

An EE/CA for the District was conducted in 2003 under contract to the San Jose State University Foundation, with technical direction from the California Department of Conservation, California Geologic Survey. The findings of the EE/CA are presented in the Final Engineering Evaluation
and Cost Analysis for the Sulphur Creek Mining District, Colusa and Lake Counties, California (CalFED Report). The purpose of the EE/CA was to present a detailed analysis of potential mine-site mitigation alternatives that could be used for decision making, and the document includes the following information:

- Background information on the District;
- Summary of prior investigations;
- Summary of mining impacts to the watershed;
- Description of applicable or relevant and appropriate requirements;
- Preliminary mitigation objectives and goals;
- Identification and screening of response actions, technology types, and process options for the District;
- Detailed analysis of potential alternatives to mitigate mercury loading to surface water in the District;
- Comparative analysis of mitigation alternatives; and
- Recommended mine-specific mitigation activities.

The EE/CA presented recommended interim and final mitigation activities for each mine site, with a focus on reducing particulate mercury loading to surface water within the district. In general, the EE/CA recommended that mining-related wastes with elevated mercury levels be excavated and removed off-site and/or consolidated and stabilized on site, with the implementation of institutional and surface water run-on/runoff controls to reduce the potential for erosion into nearby surface water.

2.3.3 Sulphur Creek TMDL Report for Mercury, 2007

In 2007, the CVRWQCB prepared a TMDL water quality management strategy for Sulphur Creek (CVRWQCB, 2007). The Sulphur Creek TMDL Report includes water quality numeric targets, assessment of mercury sources, estimated contributions and loads from different mercury sources, allocation of acceptable loads, a margin of safety, and an implementation plan. The report established TMDL targets for mercury and methylmercury in Sulphur Creek at the point of discharge to Bear Creek.

In December 2009, ERM conducted a preliminary evaluation of the data used to develop the mercury loading estimates in the Sulphur Creek basin and the TMDL for mercury and methylmercury in Sulphur Creek as
presented by the CVRWQCB in the 2007 report. That data review identified concerns that the conclusions drawn from the data presented in the TMDL Report are based on insufficient data, and poorly defined factors affecting data correlation (e.g. mercury loading from thermal springs and mercury contribution attributable to background). The findings of the ERM data evaluation indicate that the TMDL data are insufficient to:

(a) Quantify current mercury loadings to Sulphur Creek with the resolution necessary to confirm the 2007 TMDL Report conclusions based on the mean loading values;

(b) Adequately quantify total mercury contributions from thermal springs and seeps; and

(c) Reasonably predict the effect of remediation of mining-related mercury sources in the basin on the annual mercury load or the instantaneous mercury concentrations in Sulphur Creek.

This uncertainty in the understanding of mercury loading in Sulphur Creek (as exhibited by the available data) presents a very real possibility that there could be a failure to reach the numeric TMDL goal, while fully achieving the stated objective of the remediation effort (i.e., to return mercury discharge conditions from Sulphur Creek to pre-mining conditions).

2.3.4 Recent Reconnaissance of Mining-Related Material

Teams of geologists and scientists from ERM, Homestake, and others conducted two field reconnaissance visits to the Central Mine Group and Wide Awake Mine in December 2009 and March 2010. Objectives of the reconnaissances included:

- Identify potential sources of mercury to Sulphur Creek from mine tailings, waste rock and other features;
- Identify potential anthropogenic sources of mercury to Sulphur Creek; and
- Identify natural features in and around Sulphur Creek that could be contributing mercury to the creek.

Additional Site data collected by the field teams included waste rock samples, and photographs, observations, and global positioning system (GPS) locations of features of interest. General observations from the Site reconnaissance are provided below. Site features are shown on Figure 2-3, and the additional sampling data, along with estimated quantities and
locations of the mining-materials to be addressed as part of this Work Plan are provided in Section 2.5.

**Wide Awake Mine**

At the Wide Awake Mine, a waste rock pile is located on the northern end of a deeply incised section of an ephemeral tributary to Sulphur Creek, just upstream of where the tributary enters the bottom of the Sulphur Creek valley. The tributary was observed to be dry, and the sediment in the stream bottom appeared to be cemented by carbonates. A faint hydrogen sulfide odor was noted in the drainage, indicating that the carbonate cementation is likely related to periodic geothermal water discharge. Very little fine sediment was observed in the stream bed.

Retorts, tailings piles and waste rock piles were also observed over the area comprising the main mine workings and milling area. The largest of the retorts was located at the west side of the mine, adjacent to the tributary. The largest of the tailings piles was observed to the south of the largest retort. The tailings pile exhibited signs of erosion as the slopes were not vegetated and erosion channels into the ephemeral tributary were evident.

**Central Mine**

Benched tailings and waste rock were observed at the Central Mine beneath a small open pit and exposed high wall approximately ¼ mile from Sulphur Creek. A deeply incised drainage channel was observed high on the hillside to the west of the Central Mine. This drainage channel traversed what appeared to be the westernmost extent of the Central Mine past the west side of a retort. During the site reconnaissance, this incised channel was dry and is assumed to only carry water during and immediately following heavy rain. A spring was observed further down the drainage channel to the south of the retort area, and water was evident in the channel, which discharged to Sulphur Creek east of the Jones Fountain of Life. Metacinnabar was identified as a precipitate in the spring flow channel.

**Empire Mine**

The Empire Mine includes a mine portal located adjacent to the Wilbur Springs access road and a waste rock pile that is located on a hillside approximately 300 feet from Sulphur Creek. Much of the area in the vicinity of the Empire Mine is overgrown with native vegetation (digger pine and manzanita shrubs). The condition of the Empire Mine area was
evaluated during the site reconnaissance in March 2010. A part-time residence was observed within the former mine area, likely on the Empire Mine dump. The waste rock pile appeared to be capped with topsoil, and there was no evidence of erosion (or a threat of erosion) of mining-related material into Sulphur Creek at this location. Additionally, a small retort that had been reported by others to be present at the mine had apparently been removed.

Cherry Hill Mine

The waste rock piles present at the Cherry Hill mine were observed to be relatively small compared to other sites in the District, and consist mainly of cobbles and boulders. A waste rock pile was observed on the Sulphur Creek floodplain about 500 feet northeast of the Cherry Hill workings. The source of the rock in the pile is not known, but the rock appears to be of local origin. Based on the presence of a borehole marker, it is likely that this pile was placed to form a drilling platform during exploration in the area in the 1970s.

West End Mine

Two adits were observed at the West End Mine, near the top of a relatively large waste rock pile. One of the adits was blocked off with a gate, and the other was open. At the time of the site reconnaissance, the observed adits were dry with no evidence of discharge. The waste rock pile at the West End Mine is cone-shaped with steep side-slopes, and consists primarily of coarse rock fragments with very little fine material. No gullies or signs of erosion were observed on the waste rock pile during the Site reconnaissance, and the potential for significant erosion of sediments from the waste rock pile to Sulphur Creek is considered low due to the relatively coarse nature of the waste rock fragments; however, it is located adjacent to Sulphur Creek.

Manzanita

The Manzanita Mine area was observed to include several cuts and at least one adit surrounded by thin deposits of rock material from road grading activities and rockfall from the steep slopes (scree). No defined areas of waste rock were observed. During the field reconnaissance, it was noted that minor erosion channels exist below the mine and the north bank of Sulphur Creek is episodically eroding toward mineralized rock and scree associated with the Manzanita Mine area.
2.4 CONCEPTUAL SITE MODEL OVERVIEW

The conceptual site model (CSM) summarizes available information about potential sources, release mechanisms, contaminant fate and transport, exposure pathways, and potential receptors at the Site. An initial CSM for mercury was developed for the District and presented in the CalFED Report. The CSM overview presented in this section is focused on mining-related materials at the Site, and is based on ERM’s current understanding of Site conditions.

The CSM incorporates the following components:

- Naturally-occurring mercury-enriched Site soil (i.e., soil in naturally-mineralized areas and background soils);
- Mining-related sources [e.g., exploration, mining, waste rock/overburden, tailings, construction (roads/impoundments), other mine-related material]; and
- Exposure pathways and receptors of concern.

2.4.1 Naturally-Occurring Mercury-Enriched Site Soil

Mercury-enriched soil naturally occurs at the Site in localized mineralized zones and in general background areas. Mercury levels associated with mineralized zone, background soils and natural rock outcrop are discussed below.

Mineralized Area Soils

Mercury concentrations ranged from 0.07 to 520 mg/kg in forty-eight samples collected by Churchill and Clinkenbeard (2004) from mineralized area soils in proximity to mining activities in the District, and from 34 to 290 mg/kg in mineralized area soil samples collected in 2005-2006 by Holloway et al (2009). In addition to the mineralized zones around the former mines, mineralized soils may also be exposed on several road cuts in the Sulphur Creek watershed or at other small unnamed prospects.

Background Area Soils

As part of their assessment of mercury mine sources in the Cache Creek Watershed, Churchill and Clinkenbeard (2003) and Holloway et al (2009) collected over 50 samples of background soil in the District. In the Churchill and Clinkenbeard study (2003), mercury concentrations from soil samples derived from barren serpentinite and detrital serpentinite soils ranged from 0.07 to 0.31 mg/kg, and background mercury
concentrations reported for soils near mine sites ranged from 0.12 to 390 mg/kg.

Mercury concentrations ranged from 0.07 to greater than 10 mg/kg in a small set of naturally derived (background) soil samples collected outside and within areas of the District as part of the Holloway et al study (2009).

*Natural Outcrop (Homestake Data)*

Historically, the District was identified and evaluated by Homestake as an exploration target for economic gold mineralization. As part of that evaluation, a grid-sampling program was undertaken to obtain geochemical data for the project area, and ninety-four representative rock-chip samples were collected from rock outcrops and sub-crops on an approximate 400-foot grid spacing over the entire District. The rock-chip samples were analyzed for total mercury by atomic absorption techniques and the results are shown on Figure 2-8. A tabular representation of the data is provided in Appendix B (R.W. Hatch, 1983).

As shown on Figure 2-8, available background mercury data show a significant degree of natural variation across the District. Background mercury concentrations range from 0.128 mg/kg to 6,000 mg/kg, likely as a result of natural hot springs activity over the past 500,000 years.

The hydrothermal hot springs activity has produced widely variable naturally elevated mercury concentration in the areas where mining-related materials (i.e., waste rock, ore, and tailings) were placed during mining operations. Examination of the geochemical data shows that two distinct mercury concentration population ranges are present: one that occurs in rocks altered by hydrothermal fluids, and a second that occurs in rocks that were not exposed to hydrothermal fluids and are therefore unaltered. Mercury concentrations in both altered and non-altered rocks represent background conditions at the Site.

Figures B-1 and B-2, in Appendix B provide charts showing the frequency distribution for mercury values in altered and unaltered rock. Inspection of the figure shows that as expected the highest mercury values are associated with hydrothermally altered rock, which is generally within areas where mining took place. Background mercury concentrations ranged from 0.128 mg/kg to 6,000 mg/kg in altered rocks versus 0.241 mg/kg to 15.9 mg/kg in unaltered rocks.
2.4.2 Mining-Related Sources

As described above in Section 2.3.1, an assessment of mining-related sources of mercury to Sulphur Creek was conducted in 2000 and 2001 with funding by the CALFED Bay-Delta Program. The principal findings of the study are presented in USGS (2004) and in Churchill and Clinkenbeard (2003).

Fourteen historical mercury and gold mines in the District were evaluated in the CALFED study to assess their potential mercury contributions to the Cache Creek watershed. During the field investigations, mining-related materials were inventoried and samples were collected for laboratory analysis. In situations where mining-related materials appeared to be eroding into waterways, estimates of erosion rates were made using the RUSLE2 (Revised Universal Soil Loss Equation) model. The mercury concentrations and estimated erosion rates were used to estimate average annual mercury contributions from the mining-materials to local waterways.

The resulting estimate of annual mercury contributions from mining-materials in the Sulphur Creek watershed was 4 to 19 kilograms per year (Churchill and Clinkenbeard, 2003). However, the data suggest that most mercury moves from mine sites to adjacent waterways in particulate form rather than as dissolved mercury (USGS, 2004), and it is uncertain how much, if any, of the mining-related material sediment is actually transported from tributaries of Sulphur Creek and Sulphur Creek to Bear Creek, as much of the material is reportedly being deposited in dry ravines, several miles from Bear Creek.

2.4.3 Potential Future Land and Resources Uses

As described in Section 2.1.7, current land use in the District is predominantly rangeland in undeveloped chaparral and California scrub oak (Foe and Croyle, 1998). Wilbur Hot Springs Spa and Resort is located downstream of the Site. Most of the surrounding land is managed by the BLM. A smaller part of the Sulphur Creek watershed is privately owned and cattle graze on some private property in the lower watershed. Additional land uses include firewood harvesting and recreation. Future land use is expected to remain similar to current conditions.

2.4.4 Potential Exposure Pathways and Receptors of Concern

The term “exposure” is used to describe contact with a substance (e.g., mercury) by swallowing, breathing, or touching the skin or eyes.
Exposure may be short-term (acute exposure), of intermediate duration, or long-term (chronic exposure). An exposure pathway is the route a substance takes from its source to its end point, and how the human and/or ecological receptor comes into contact with the substance.

Human exposure to mining-related materials is possible at the Site for potential future on-site residents, subsistence farmers, health spa users, and outdoor workers. The primary potential routes of exposure to mercury in mining-related materials are direct contact and incidental ingestion.

Ecological concerns with mercury/methyl mercury are predominantly associated with aquatic systems, thus the ecological receptors and potential exposure pathways focus on freshwater aquatic habitat and associated biota observed and/or anticipated in the Sulphur Creek drainage. However, Sulphur Creek and tributaries at the Site do not support fish and portions are dry during the summer. In the Amendment to the Basin Plan, the CVRWQCB concluded that municipal and domestic supply (MUN) beneficial use and the human consumption of aquatic organisms use do not exist and these beneficial uses cannot be attained in Sulphur Creek due to natural sources of dissolved solids and mercury (CVRWQCB Resolution No. R5-2007-0021). As such, there are no fish and limited aquatic receptors at the Site. Further, the USGS (2004) concluded that most mercury moves from mine sites to adjacent waterways in particulate form rather than as dissolved mercury, and it is uncertain how much, if any, of the mining-related material sediment is actually transported to Bear Creek, as much of the material is reportedly being deposited in dry ravines, several miles from Bear Creek.

Wildlife within the area may come into direct contact with the mining-related materials. The primary exposure route would be ingestion of mercury-containing materials while foraging.

2.4.5 Summary of Potential Site Risks

A brief overview of the potential risks to human health and ecological receptors resulting from the potential exposure to mining-related materials at the Site is provided in the following subsections. Removal

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3 Though potential receptors, exposures via drinking water are likely to be insignificant given that the Wilbur Hot Springs resort obtains drinking water from shallow groundwater wells on a ridge above Sulphur Creek (CVRWQCB, 2007). Water from these wells have a different source than the Wilbur Hot Springs Geothermal area.

4 Sulphur Creek from Schoolhouse Canyon to the mouth.
and/or proper disposal of the mining-related materials will mitigate potential exposure pathways.

2.4.5.1 Summary of Potential Human Health Risks

As described above, potential exposure to mercury in mining-materials is possible through direct contact of skin with mercury-containing material, inhalation of volatile elemental mercury (if present) or particulates containing mercury, and/or incidental ingestion of mercury containing particles. Mining-related material present at the Site contain mercury that may potentially pose a threat to human health due to exposures through recreation or work at the mine sites (e.g., recreational exposure can occur during hiking, camping, hunting, or rock collecting at or near the mine areas).

2.4.5.2 Summary of Potential Ecological Risks

As discussed above, animals can ingest or directly contact mercury-bearing mining-related material. In addition to potential toxicity effects on organisms caused by exposure to mercury, mercury has the potential to accumulate in biota. Natural hydrothermal altered areas and the mine sites contain mercury concentrations that potentially pose a threat to ecological receptors.

2.5 MINING-RELATED MATERIAL WASTE CHARACTERIZATION

This section describes the approach used to classify Site mining-related materials for disposal, previous mining-related material characterization sampling, the March 2010 mining-related materials characterization sampling, and the estimation of mining-related material volumes and areal extent.

2.5.1 Approach to Mining-Related Material Classification

The mining-related material characterization approach was intended to determine appropriate waste designations, and therefore disposal options, for mining-related materials at the Site in accordance with Resource Conservation and Recovery Act (RCRA) and State of California regulations. RCRA was amended in 1980 by the Bevill Exclusion, to exclude "solid waste from the extraction, beneficiation, and processing of ores and minerals" from regulation as hazardous waste under Subtitle C of RCRA. The mining-related materials to be removed from the Site meet the criteria under the Bevill Exclusion.
The State of California waste regulations acknowledge the Federal exclusion, but include the following waste classifications for mining-related solid waste:

- **Group A** – Mining-related waste determined to be a significant threat to groundwater quality and that the CVRWQCB determines must be managed as hazardous waste.

- **Group B** – Mining-related waste that consists of or contains materials that pose a significant risk to water quality, but that qualify for a variance, provided that the CVRWQCB finds such mining wastes pose a low risk to water quality.

- **Group C** – Mining-related waste from which any discharge would be in compliance with the applicable water quality control plan, including water quality objectives other than turbidity.

Based on the available data collected to date and regulatory definitions, Group A wastes have not been identified at the Site.

### 2.5.2 Previous Mining-Related Material Waste Characterization Sampling

Mining-related material characterization sampling was conducted at the Central Mine Group and Wide Awake Mine as part of the CALFED – Cache Creek Study, and the results are provided in the CalFED Report. Total mercury concentrations are also available for selected materials from assays that were completed by Homestake during exploration activities, as well as from more recent Homestake sampling events that were completed to provide preliminary material characterization information. Table 2-2 summarizes the available analytical results for mercury from these previous sampling events.

In the CALFED study, samples were collected from several waste piles located within the Central Mine Group and Wide Awake mines. The samples were analyzed for leachable antimony, arsenic, chromium, mercury, and nickel using the CalWET. Of the metals analyzed, only mercury was detected in the leachate at a concentration greater than the soluble threshold limit concentration (STLC). Mercury concentrations in the other samples collected were one to two orders of magnitude less than the STLC, and results for each of the other metals were one to four orders of magnitude less than the STLC.

Based on the general knowledge of the geologic formation and the previous material characterization test results provided in Table 2-2, the
March 2010 material characterization sampling focused on total and leachable mercury for waste group determination.

2.5.3 March 2010 Mining-Related Materials Waste Characterization Sampling

ERM conducted a field program in March 2010, to collect additional data to characterize and estimate the quantities of mining-related material, including waste rock, tailings, mercury-enriched soils, ore, and mining equipment remaining at the Site, in preparation for removal activities. A secondary objective of the field program was to gather additional data to evaluate whether portions of the waste rock and tailings piles meet criteria for processing for gold reclamation. Waste rock and tailings containing greater than 2 mg/kg (0.06 ounces/ton) of recoverable gold could be considered for processing as ore rather than disposal as a waste.

The Empire Mine was not included in the mining-related material inventory. The only known waste rock pile at the Empire Mine is far from Sulphur Creek, has been built upon, covered with soil and vegetated, and there is no evidence of a threat of erosion of mining-related material into Sulphur Creek at this location. Further, the EE/CA concluded that erosion was not occurring from mining-related materials and complete pathways from mine-related sources to Sulphur Creek did not appear to be present, which was also confirmed during 2010 site reconnaissance. Therefore, and as concluded in the EE/CA, no removal action will be conducted at the Empire Mine by Homestake.

2.5.3.1 Sampling and Analysis

During the March 2010 field program, ERM collected samples of mining-related material at the Site for the purposes of material characterization. Details related to sampling procedures, and laboratory analytical methods are provided in the Sampling and Analysis Plan for Mining-Related Waste Characterization (ERM, 2010) and are included as Appendix C. A summary of the materials sampled and analytical methods used are described below.

Structures and Equipment

Samples of brick, ceramic, and/or dimension stone were collected from each ore processing structure remaining at the Site. Samples were analyzed for total mercury and STLC mercury (leachable mercury) using U.S. Environmental Protection Agency (USEPA) Method 7471A and the CalWET Method, respectively.
Metal equipment, such as pipes and retort remnants, were not sampled, but will be visually inspected for the presence of elemental mercury during removal activities.

**Waste Rock, Tailings and Ore**

Visual observations were recorded for each pile encountered, including the color and grain size distribution for the material, and the type and density of vegetation growing on the material. The number of samples collected at each mine was dependent on existing data and the total volume of waste rock, tailings and/or ore present, as follows:

- Mines with greater than 5,000 cubic yards (cy) of waste rock, tailings, and/or ore – Four or more composite samples consisting of three point samples with each composited in the field.
- Mines with less than 5,000 cy of waste rock, tailings, and/or ore – One or more composite samples consisting of a three point composite sample that was composited in the field.

Additional samples were collected from miscellaneous small deposits as needed. For example, an additional discrete sample was collected from a small calcine and ash pile at the Wide Awake Mine. Because no distinct piles or areas of mining-related materials are present at the Manzanita Mine, the samples were collected from scree adjacent to the mine workings.

Composite samples collected from waste rock and tailings deposits were analyzed for STLC mercury using CalWET. Composite samples from the Wide Awake, West End, and Cherry Hill Mines were also analyzed for gold content and suitability for ore processing using the following methods:

- Total gold by fire assay;
- pH by USEPA Method 9045C; and
- Total sulfide by USEPA Method 9034.

Material with a gold content of 0.06 ounces per ton or greater may be suitable for ore processing depending on its sulphur or sulfide content.

2.5.3.2 **Waste Characterization Results**

A summary of sample results from past characterization efforts and the March 2010 field activities are provided in Table 2-3. Materials handling and disposal conclusions based on the sample results are summarized in
Table 2-3. The basis for the conclusions summarized in Table 2-3 is described in the Section 2.5.1 above. The laboratory reports for the waste characterization samples are provided in Appendix D.

Table 2-3 provides a summary of the CalWET solubility for each of the mine material piles/areas shown on Figure 2-8. Solubility data is available for waste rock, calcine tailings, scree, retort soil and ash. The table shows the results of 23 total samples comprised of 18 three-point composites collected by ERM in 2010 and 5 individual grab samples collected in 2003 as part of the CalFED Report.

The results show that the average mercury solubility value for each mine material pile is well below the STLC limit concentration of 200 ug/L. In fact, the results for most of the discrete mine material piles/areas identified on Figure 2-9 (9 of 13) are non-detect for dissolved mercury. These results show that the mercury contained in the material is stable and not prone to dissolution or leaching for all material types: waste rock, calcine tailings, scree, retort soil and ash. These results support the conclusion that all the material identified and sampled is Group C mining-related waste and the focus of remediation should be to remove the connection between the mine-related material and Sulphur Creek.

2.5.4 **Estimation of Mining-Related Material Volumes and Areal Extent of Material**

The locations and extent of mining-related wastes at the Site are shown in Figure 2-9. An inventory of the mining-related materials, including volume estimates, is included in Table 2-4.

Volumes of waste rock and tailings piles were estimated using the following procedure:

- The locations of points at the margins of the piles and on the piles were established using a GPS unit;
- The pre-accumulation ground surface topography was estimated by interpolation of surrounding topography based on the available geolocated base map;
- Using three-dimensional rendering software, the original land surface and current pile configuration were matched, and the volume of the resulting figure was calculated; and
- The calculated volumes were confirmed and adjusted based on site observations and photographs.
Volumes of materials contained in structures at the Site were estimated based on dimensions measured in the field and estimated from field observations and photographs.

The preliminary total volume of mining-related materials to be managed is approximately 58,800 cy. Of the total managed volume, 9,600 cy may be reclaimed for gold processing (West End and Manzanita materials) and 49,200 to 58,800 cy of mining-related material is expected to be removed for disposal off-site or recontoured (managed in place). Approximately 30,800 cy of material is present at the Wide Awake Mine, and 28,000 cy of material are present in the Central Mine group area. Of the Central Mine group material, approximately 17,800 cy of material are present in the Central Mine waste rock dump.
3.0 REMEDY APPROACH AND SCOPE OF WORK

This section describes the planned remediation activities of mining-related material to be performed by Homestake at the Site, including material characterization, permitting, Site preparation and control, mining-related material removal and in-place management, waste management, removal confirmation, and Site restoration.

The proposed plan for mine-related material remediation is consistent with previous federal and state recommendations for the District. The USGS (2004) and Churchill and Clinkenbeard (2003) reports concluded that effective mine site remediation should be based on general site erosion control and mining-related material isolation measures. Similarly, the CalFED Report recommended that mining-related wastes with elevated mercury levels be excavated and removed off-site and/or consolidated and stabilized on site, with the implementation of institutional and surface water run-on/runoff controls to reduce the potential for erosion into nearby surface water.

Detailed descriptions of the remediation design, methods, and procedures are provided in Section 4.

3.1 MINING-RELATED MATERIAL WASTE CHARACTERIZATION

ERM conducted a field program in March 2010 to characterize mining-related material, including waste rock, tailings, ore, mercury-enriched soils, and mining equipment present at the Site. This information was used in conjunction with existing data to classify the material for disposal during remedy implementation. A secondary objective of the field program was to gather additional data to determine if portions of the remaining ore piles meet the criteria to be processed for gold reclamation. Waste rock and tailings characterized with greater than 2 mg/kg (0.06 ounces/ton) of recoverable gold will be considered for processing as ore rather than disposal as a waste.

The March 2010 material characterization and classification activities are summarized in Section 2.4 and available material inventory and characterization data are provided on Tables 2-3 and 2-4. Analytical results used to determine material handling and disposal requirements are summarized in Tables 2-2 and 2-3. If previously unidentified structures, equipment, waste rock, tailings, or ore are observed during remedy
implementation, these materials will be sampled and classified for disposal as described in Section 2.3.2, following the procedures outlined in the Sampling and Analysis Plan (SAP) provided as Appendix B to this Work Plan.

Mine-related equipment, such as pipes and retort remnants, will be further evaluated to determine if removal is necessary. Factors to be considered include historical significance, proximity to creeks, and evidence of elemental mercury. The equipment will be visually inspected for the presence of elemental mercury during removal activities. If mercury is observed in metal equipment, those pieces of equipment will be appropriately isolated and the mercury removed. Metal structures that were in contact with the mercury, if present, will be characterized appropriately and may be disposed accordingly.

3.2 PERMITTING

All necessary approvals will be obtained prior to initiating the remediation activities described in this Work Plan to ensure the project is completed in compliance with applicable regulatory requirements. The general approach to the permitting process will be to:

- Identify potentially applicable approvals required from regulatory agencies and private parties;
- Meet with key regulatory agencies for pre-application meetings to confirm the potential requirements, and establish early communication with agencies and adjust data needs as required; and
- Facilitate the approval process from pre-application to submittal and approval.

Tracking of the approval status and compliance with the potential requirements will be conducted including:

- Use of a permit tracking matrix to manage submittal of materials and status of approvals. (See Table 3-1 for a simplified matrix of the key approvals that are anticipated for the project.) A master permit list with more detailed information on permit requirements and planned dates has been prepared and will be updated throughout the project for use as a tracking and management tool.
- Development of specific oversight plans and documentation as required for permit compliance.
- Implementation of field monitoring requirements, as needed. Work monitoring and inspection activities (e.g., monitoring of BMPs) required
by applicable permits during field work/construction will be implemented into the bid specifications.

3.3 SITE PREPARATION AND CONTROL

This section describes the Site preparation and control activities that will be completed prior to and during remediation and restoration work at the Site, including Site access agreements, mobilization and demobilization, material and equipment staging, road construction and improvements, and transportation.

3.3.1 Site Access Agreements

Access agreements will need to be negotiated with the current landowners at the Site. Other agreements with landowners would be required if mining-related material is consolidated and stored on Site.

3.3.2 Mobilization and Demobilization

Mobilization and demobilization will include all work necessary to manage operations for the duration of the project. Mobilization will be an ongoing task as new resources are needed for specific operations. The project-specific Health and Safety Plan (HASP) will be completed as part of the mobilization phase. A Draft HASP will be finalized prior to beginning field activities, with input from the selected contractor during the pre-mobilization phase of work. Equipment will be cleaned to limit noxious weed transport to the Site. A Storm Water Pollution Prevention Plan (SWPPP) will be prepared prior to the initiation of any soil disturbing activities at the Site.

Demobilization will include the removal of all equipment and personnel mobilized to the site and waste generated during the duration of the project. Final demobilization will include cleanup and restoration of all staging areas to pre-existing conditions. At the conclusion of the 2011 construction season, areas will be secured and appropriate storm water BMPs will be implemented to reduce the potential for site activities to impact storm water run-off. Final demobilization will occur at the completion of work in 2011.

3.3.3 Erosion Control

Remediation of the mining-related materials will require establishing equipment access (including three stream crossings) and the excavation,
loading, and haulage of the materials. The disturbance associated with these activities will need to be mitigated to prevent erosion. This mitigation will involve the regrading and reclamation of the natural ground surface and the temporary placement of erosion control BMPs.

BMPs will be selected based on the planned reclamation activities and include categories related to erosion control, sediment control, tracking control, wind erosion, non-storm water controls, and waste management and materials control. These BMPs can include, but are not limited to:

- Grading;
- Silt Fences;
- Straw Bales;
- Fiber Rolls;
- Loose Straw Ground Cover;
- Grass filters;
- Sand/Gravel Bags;
- Dust Control Moderation;
- Good House Keeping Practices;
- Site Entrances and Exit Maintenance; and
- Management of Construction-Related Wastes.

The combination of the above-listed BMPs will protect the storm water quality during reclamation activities. Procedures to ensure proper implementation of erosion control BMPs during remediation will be identified and described in the SWPPP. The SWPPP will be established prior to starting any soil disturbing activities associated with construction work at the Site, and will be included as necessary in permitting documentation. Specific construction activities likely to require erosion control measures are addressed in the task descriptions in the following sections. Erosion control materials will be on standby for use if rainfall events occur during construction activities.

3.3.4 Material and Equipment Staging

All materials and equipment will be staged to the northeast of the Cherry Hill Mine. The approximate location of the materials and equipment staging area is shown on Figure 3-1. Field offices, temporary facilities, and storage containers will be located in this area. Final determination of
the staging area location will be approved by the Field Engineer prior to mobilization. Each work area will have a temporary staging area for equipment and personnel while working remotely at each mine. These areas will be determined and approved by the Site engineer.

An emergency helipad landing area will also be delineated to the west of the West End Mine (Figure 3-1). This area will be kept clear at all times during removal and restoration activities. The final location of the helipad will be determined with CAL-Fire during the pre-mobilization phase of the work.

3.3.5 **Road Improvements and Construction**

Site access and mine access road construction and improvement will be required throughout the project. Preliminary plans for road construction and improvement are shown in Figure 3-1. Proposed locations of access routes and stream crossings are preliminary and will be revised as necessary pending additional information from wetlands delineation and other site conditions. Access improvements will be located to minimize disturbance.

The existing Site access road directly from Highway 20 will require improvements and upgrades to handle daily traffic to the Site including light trucks, equipment delivery, and material export trucks. Improvements include general grading to remove ruts, application of crushed rock for traction and to prevent wear, and the repair of three locations where the road has washed out. The road repair will include the placement or replacement of existing culverts for proper run-off, armoring the banks of the road in those areas with rock to prevent future erosion, and compaction to prevent sinkholes. No change to the width or current location of the existing road is planned. These improvements have been tentatively approved by the Ukiah BLM staff and will be completed during the pre-mobilization stage of the project.

Temporary access routes to each of the Central Mine Group and Wide Awake mines will be required. These routes will consist of a combination of improved existing roads and new roads. The mine access roads will be used for access by construction equipment and off-road dump trucks. Existing roads will be graded as needed to facilitate the movement of trucks. New roads will be constructed on an as needed basis to access the mines.

Two of the mine access roads will include temporary bridges; one crossing at Sulphur Creek, and one at an existing at-grade vehicle crossing near the
Wide Awake Mine (Figure 3-1). Impact to surrounding areas will be minimized to the extent practical, and existing roads will be used when possible. When temporary bridge placement is required, the contractor will place steel “I” beams parallel to the stream bank and lay the bridge across the beams. The “I” beams will help distribute the weight and minimize damage to the bank. If needed, concrete support columns will be set under the bridge in the stream bed. Existing rock in the bed will be removed prior to the placement of the column for replacement when done. The deck of the bridge will be rated to handle the weight of loaded equipment.

In the event that any roads cross a drainage channel, existing culvert, or small tributary, a replacement culvert will be installed or temporary steel plating will be placed across to keep drainage areas open.

Mine access roads will be removed and reclaimed upon completion of work, as described in Section 3.7.

3.3.6 Transportation Plan

A Site Transportation Plan will be prepared during pre-mobilization activities and will cover both on- and off-site transport of mining-related material and other material generated during Site removal and restoration activities. The transportation plan establishes procedures to minimize the environmental and health and safety risks associated with materials transportation conducted for the project.

3.3.7 Dust Control

Reclamation activities anticipated to generate dust during the project include construction vehicle traffic and ground disturbance activities associated with material removal and re-contouring. Routine dust control measures will consist of water spray to moisten disturbed areas, on-site haul roads and other areas, as needed (e.g., unpaved construction roads are commonly watered three or more times per day during the dry season). If dust emissions are visible, dust control practices will be modified or other corrective measures will be implemented immediately.

3.4 MINING-RELATED MATERIAL REMEDIATION

This section describes the remediation (e.g., removal and management-in-place) of mining-related materials, including structures and equipment,
waste rock, and tailings. A summary of the planned removal and cleanup activities is included in Table 3-2.

Based on preliminary evaluation, which would be subject to Regional Board approval, it is anticipated that there will be three groups of materials addressed in remediation at the Site:

- Group C mining-related materials at the Central, Manzanita, and Wide Awake Mines;
- Group B and C mining-related materials from the remaining mines (except West End Mine); and
- Gold-bearing ore from the West End Mine and Manzanita Mine.

The Group C mining-related materials from Central Mine will be managed in place by re-grading and capping. Other Group C mining-related materials from the other mines will be managed in place or on-site in a location such as the Central Mine. Options for disposal of Group B materials, if identified, include the following:

- Off-site disposal at the Homestake McLaughlin Mine Pit;
- Off-site disposal at an alternative licensed Class B facility; and
- On-site disposal in a constructed Class B containment unit.

Homestake’s McLaughlin Mine is a permitted Group B facility and is located approximately 40 miles from the Site. If an on-site Class B unit is selected as an option, construction plans in accordance with Class B unit rules will be prepared.

3.4.1 Structures and Equipment

The following mining-related structures and debris will be evaluated as described in Section 3.1 for potential off-site disposal:

- Central Mine brick retort/furnace;
- Wide Awake Mine retorts/furnaces; and
- General scrap wood and steel.

An inventory of the mining-related equipment to be evaluated is provided in Table 2-4 and shown on Figure 2-9. The mining-related material management plan is provided in Section 3.5.
3.4.2 Waste Rock, Tailings, Stockpiled Ore and Soil

Waste rock, calcined tailings, stockpiled ore, and mercury-enriched soils related to mining activities will be removed from the individual mine area using excavators and/or back hoes. A complete inventory of the mining-related materials to be removed is provided in Table 2-4 and shown on Figure 2-9. A mining-related material management plan is provided in Section 3.5.

The material will be segregated based on its final disposal location (i.e., off-site disposal/landfilling, off-site transport for recycling, or on-site stabilization) based on available material characterization data. Materials to be taken off-site will be loaded directly into bulk transporters or into on-site trucks for stockpiling at the staging area. Materials for on-site stabilization will be re-graded in the immediate area. The materials will be excavated or dozed such that material from the mining impacted areas does not enter surrounding creeks.

3.4.3 Mine Adits and Shafts

Many of the mine sites include the presence of open adits and shafts. Shafts are to be either backfilled or plugged to effectively remove the safety hazard associated with the openings. Since each site is unique, the successful contractor is to submit a detailed proposal for the closure of each shaft to the Owner and Engineer for review and approval. Adits are similarly associated with a safety hazard requiring mitigation; however they are also commonly associated with habitat for wildlife, in particular for communities of bats. It is expected that all open adits will be closed using a locking steel grate that will prohibit human access while continuing to provide access for bats. Again, since each Site is unique, the successful contractor will submit a detailed proposal for the closure of each adit to the Owner and Engineer for review and approval.

3.5 MATERIAL MANAGEMENT PLAN

This section describes the material management plan for Site mining-related material, including structures and equipment, waste rock, calcined tailings, stockpiled ore, and mercury-enriched soils.

3.5.1 Recycling and Disposal of Structures and Equipment

Mine-related equipment, such as pipes and retort remnants, will be further evaluated to determine if removal is necessary. Factors to be
considered include historical significance, proximity to creeks, and evidence of elemental mercury. If equipment or structures require disposal, then the procedures that would be followed are described below.

Where possible, based on the available material characterization data, remnants of former mining-related structures and equipment will be recycled. Only those materials demonstrated to contain concentrations of mercury below applicable regulatory limits will be considered for recycling. Materials will be sorted by type (i.e., brick/concrete, dimension stone, wood, and metal) in the staging area as they are removed from each mine. Brick, dimension stone, and concrete debris will be transferred to a recycling facility or disposed as construction waste, depending on condition; wood will either be recycled or disposed of as construction waste depending on condition; and steel will be transferred to a recycling facility as general scrap metal.

3.5.2 On-Site Stabilization

Mining-related materials that are characterized for on-site stabilization will be graded as described in Section 3.7.2 to prevent erosion of mercury-containing mining related material to Sulphur Creek.

On-site or in-place stabilization will be completed for materials that are distant from Sulphur Creek and major creek tributaries, so that they will not be actively eroding material directly to the creek or major tributaries. Materials that are moved will be placed in lifts, key coated into existing slopes and compacted between lifts. Water trucks will provide water that will be used for dust control as well as to enhance soil compactability. Lifts will be key coated in for stability and erosion control. Once final grading is complete, the materials will be capped with soil. The source of the borrow soil will be determined prior to contractor selection for reclamation activities. The cap material will be key coated into the surrounding native material and proof rolled for compaction.

As discussed with CVRWQCB during the Site visit in August 2010, removal or re-contouring the scree on cliffs and steep slopes at Manzanita Mine will not be conducted. However, existing gullying/erosion areas will be stabilized during reclamation and restoration activities. The approach for regrading and stabilization is described in Section 4.4.3.

Due to steep slopes and close contact with creek bank, there is the potential that minimal material from the Wide Awake mine area may best managed in place. The approach to address this situation, if it occurs, is described in Section 4.4.4.
3.5.3 Disposal at Off-Site Facility

If encountered, waste rock, tailings, and soils that do not meet on-site stabilization requirements, are not recycled, and are classified as Group B waste will be placed in an on-site Class B facility, transported to a permitted Group B facility, or transported and placed within the northern end of the McLaughlin Mine.

3.5.4 Ore Processing

Waste rock, tailings, or stockpiled ore that can be processed, on economically acceptable terms to Homestake may be sent to a Nevada processing facility in compliance with the Site Transportation Plan.

3.5.5 Hazardous Waste

Although not anticipated, hazardous wastes generated during the project will be transported to an appropriate hazardous waste landfill facility for disposal. The Transportation Plan will include, if required, trucking routes and manifest required for the hazardous waste facility. The final hazardous waste disposal facility will be determined based on the waste characteristics, waste profile, and the acceptance criteria for the available disposal facilities.

Bevill wastes, transported off site for disposal, will be manifested as hazardous materials to meet Department of Transportation regulations.

3.6 REMOVAL CONFIRMATION

Because of the natural variation in background mercury concentrations at the Site (Section 2.4.1), the extent of excavation of mining-related waste rock, ore, and tailings at the Site will be determined in the field using qualitative (visual) techniques before and during excavation activities. Samples for laboratory analysis will not be collected to confirm removal and/or stabilization limits or boundaries.

The horizontal and vertical limits of the waste rock, ore, and tailings piles will be identified and confirmed using the following guidelines:

- Topographical expression (many material piles have well-defined topographic profiles);
- Color change (calcine tailings have a distinctive reddish color);
- Presence of buried soil horizons, as evidenced by the presence of organic material, roots, and developed soil horizons;
- Presence of in-place bedrock;
- Presence of laminated or bedded fine-grained material indicative of natural overbank deposits; and
- Presence of an abundance of rounded gravel and cobbles indicative of former stream bed or stream terrace deposits.

Delineation of the horizontal and vertical limits of the waste rock, ore, and tailings piles will be conducted by or under the direction of registered Professional Geologists with relevant expertise in accordance with California Business and Professions Code sections 6735, 7835, and 7835.1. The delineation tasks will also be documented and reported to the CVRWQCB.

Examples of the contact between native material and mining derived material are provided in Photos E-1 through E-3 in Appendix E. In order to distinguish mining-related materials from natural soils and rock materials, the following guides will be used; the soil classification guidelines published in American Society for Testing and Materials Standard D-2487, The Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System). The available guidelines will be applied in a manner that allows for the removal or stabilization of all targeted mining-related materials while minimizing the removal or disruption of in-place naturally-occurring materials.

Surficial soil removal is planned in the vicinity of the retorts and furnaces identified in Table 2-4 and shown on Figure 2-9. At each of these locations, up to the upper 1 foot of native soil (if present) will be removed and disposed within a radius of up to 25 feet around each retort or furnace. Note that additional soil excavation will not be completed in areas within that radius where waste rock or tailings have been removed.

3.7 SITE RESTORATION APPROACH

This section describes the site restoration approach, including temporary road removal; regrading, slope stabilization and bank stabilization; and re-vegetation.
3.7.1 Temporary Road Removal

All mine access roads or constructed temporary roads, bridges, or steel plates used during construction will be removed and the area restored upon the completion of work in that area as described in Sections 3.7.2 and 3.7.3. Unless required for future access or requested by the landowner, culverts placed or repaired during the construction of the roads will be removed and disposed of in accordance the recycling plan described in Section 3.5.1.

3.7.2 Regrading, Slope Stabilization, and Bank Stabilization

Disturbed areas and temporary roads will be restored upon completion of all removal and/or on-site stabilization activities. Slopes and roads will be graded to a natural line that limits run-off and drainage. Fill material will be borrowed from on-site as need for grading and stabilization. Positive drainage will be achieved to minimize ponding of water. Slopes will be stabilized by eliminating run-off from the top of the slope or cutting the slope back to slow storm water run-off. Grading around on-site stabilized materials will be used to divert storm water away from the stabilized material. Grading near creeks will be completed to limit stream bed disturbance and maintain the natural flow. The grading of site areas will remain above the creek elevation to minimize the potential for undercutting.

Creek banks will be stabilized on an as needed basis. Temporary bank stabilization measures may be necessary at the two planned temporary bridge crossings over Sulphur Creek (Figure 3-1). Also, the north bank of Sulphur Creek adjacent to the Manzanita Mine area will be stabilized to minimize lateral creek migration. The Manzanita Mine area bank/stream stabilization plan is described in more detail in Section 4.4.5.

3.7.3 Re-vegetation and Monitoring

The preliminary Vegetation Restoration Plan (Revegetation Plan) is attached as Appendix F of this Work Plan. As agreed between Homestake and the CVRWQCB, Homestake will be responsible only for the initial broadcast seeding of early succession stage native herbaceous grasses and/or forbs. Accordingly, this Revegetation Plan focuses on Year 1, Seeding of Early Succession Herbaceous Grasses and/or Forbs.

Disturbed Site areas will be revegetated following the completion of the construction season during the project, just prior to the first rain events. This is anticipated to occur during the Fall of 2011. Revegetation will include hydro seeding, or other techniques where more appropriate, with
an appropriate soil stabilization seed mix. Upon completion of re-
vegetation activities initiated by Homestake, a Site inspection with the
CVRWQCB will be scheduled. See Section 4.4.6 for additional details of
the Revegetation Plan.
4.0 REMOVAL DESIGN, METHODS AND PROCEDURES

This section describes the removal design, methods and procedures, including sample collection and analysis, Site preparation and control, mining-related material removal, site restoration design, equipment decontamination, geolocation, and recordkeeping.

4.1 SAMPLE COLLECTION AND ANALYSIS

Although not anticipated, samples of previously uncharacterized structures, equipment, waste rock, tailings, or ore, if encountered during remedy implementation, will be collected and analyzed following the procedures outlined in the project SAP (Appendix C). Metal equipment, such as pipes and retort remnants will be visually inspected for the presence of elemental mercury during removal activities. If mercury containing metal equipment is observed, containment, profiling, and disposal procedures described in Section 3.1 will be implemented.

4.2 SITE PREPARATION AND CONTROL

This section outlines the site preparation and control methods and procedures to be implemented during site removal and restoration activities, including mobilization and demobilization, materials and equipment staging, and road construction and improvements.

4.2.1 Mobilization and Demobilization

Mobilization and demobilization includes all work necessary to manage operations for the duration of the project. Mobilization tasks will include, but are not limited to:

- Project management of all construction operations;
- Completion and maintenance of the HASP;
- Delivery of all equipment and materials to support work and health and safety requirements;
- General site preparation, including fencing, helipad and signage, to support operations for the duration of the project; and
- Installation and maintenance of all storm water BMPs.
Demobilization tasks will include, but are not limited to:

- Temporary site controls and facilities established by the subcontractor are removed from the Site;
- Any damage caused by temporary site controls and/or removal work is repaired by the subcontractor;
- Verify that post-construction Storm Water Protection Plan BMPs are in place at the conclusion of the project;
- Decontamination of all equipment leaving the site; and
- Final inspection by CVRWQCB at the conclusion of the project.

4.2.2 Materials and Equipment Staging

The material and equipment staging area will be located on the valley floor as shown on Figure 3-1. The staging area will house field offices, equipment and material storage, and heavy equipment staging areas. Stockpile staging for mining-related materials and debris to be hauled off-site will also be conducted in this area.

The staging area will be located in an area that is not impacted by past mining operations. Only minor or emergency equipment repair or maintenance will be completed in the staging area. Activities will be conducted within the staging area in a safe manner that is protective of the environment. All generators used for power will have secondary containment for fueling and a spill response kit available at all times. The equipment maintenance area will also have secondary containment as well as storm water BMPs in place to protect the surrounding area. Note non-emergency maintenance will be conducted off site.

Storm water BMPs will be in place anytime material is being stored in the stockpile portion of staging area. Stockpiles will be covered if substantial rain is in the forecast and run-off is possible. At a minimum, BMPs will consist of straw wattles around the base of the pile and silt fence around the perimeter of the stockpile area.

Both the materials and equipment staging area will be restored as described in Section 4.4 upon completion of the project.

4.2.3 Road Construction and Improvement

Road construction and improvement will be an ongoing task during the project. Portions of the main Site access road and mine access roads will need to be repaired, upgraded, and/or constructed during removal
activities. The following improvements will be made to the existing main Site access road prior to mobilization to the Site:

- **Grading** – The road will be graded and cleared along its entire length. The road will be improved and maintained so that equipment deliveries as well as off-site trucks can utilize the road without failure for the construction season.

- **Signage** – The road will be marked at both ends with appropriate signage to warn drivers that the road is single-lane and not open to the general public. Potentially hazardous sections of road, e.g., drop offs, will be marked with orange snow fence. Blind corners will have signage to instruct drivers to sound horn before approaching. Speed limits will be posted at both ends of the road.

- **Road Covering** – Material from the off-site borrow pit along the access road will be used as a gravel surfacing. The material will minimize dust and provide traction for the trucks. The borrow material will be selected so that it will not be a significant source of mercury.

- **Culvert Repair** – Three locations along the road will require existing culverts to be removed or a culvert to be put in place for natural drainage crossing. The replacement will include repair of the adjacent slope if necessary with soil and rock. Repaired area will be sloped to minimize the potential for washouts.

- **Sink Hole Repair** – Areas along the road that have sinkholes will be repaired. Material from the surrounding area will be placed into the hole and compacted in lifts to minimize the potential for road failure in the area.

Mine access roads will be constructed or existing roads repaired on an as needed basis. Tasks that will be performed for mine access road construction include the following:

- **Grading** of existing road for use by off road trucks and equipment will be kept to a minimum. Roads will only be scraped to remove ruts, large rocks, or widened for safe passage of the largest piece of equipment using the road. These roads will be constructed by using a dozer to create a road and berm the spoils along the outer edge of the road for use later. The maximum road width will be 14’ except in turn out areas. Roads will be re-contoured to minimize the disturbance of existing slopes.

- **Replacing or extending** drainage culverts will be required to accommodate larger vehicles.
• Temporary bridges will be placed to access the Wide Awake and Central Mine Group areas - New culverts, steel trench plates, or a combination of the two will be used at locations where existing culverts or drainage channels require additional support. The three planned locations are depicted on Figure 3-1. Example diagram for a typical crossing is provided in Figure 3-2; however, the selected contractor/Engineer will make decisions on the crossing based on the size of equipment.

• Constructing new roads into mine areas where no current access exists. New access roads will be constructed only when needed. Each road will be constructed with a dozer just deep enough to removed vegetation and wide enough for the largest piece of equipment to access. Any material removed from the road will be bermed on the side for revegation use when the work is complete. Depending on the length of the road, turnouts for passing may be placed every 1,000 yards. Roads will be constructed along contour as much as possible while providing safe passage of trucks and equipment. Turns will be kept wide so that additional rutting and damage to the area does not occur.

Tree removal and/or trimming to facilitate road placement may be required, but will be minimized to the extent practicable, and impacts to surrounding areas will be minimized.

Temporary bridges will be set on the creek banks at two locations (Figure 3-1). Steel I-beams will be set back from the bank and placed parallel to the creek to distribute the weight of the bridge and load while minimizing the damage to the creek bank. Concrete anchor blocks and cables will be used to minimize movement of the bridge on both sides. A support block may be placed in the creek bed to support the center of the bridge span. The deck itself will consist of a portable bridge deck, a flat rail car, or equivalent, rated for the expected weight. Both reaches where temporary bridges are planned are expected to be dry during Site operations.

4.3 MINING-RELATED MATERIAL REMEDIATION

This section describes the mining-related material remediation methods (i.e., removal and managed-in-place) and procedures to be implemented during Site removal and restoration activities, including required equipment; structures and equipment removal and staging; waste rock and tailings removal, segregation, and staging; and transportation.
4.3.1 Required Equipment

The removal of mining-related materials (e.g., rock, tailings, and debris) will require the use of heavy equipment, including:

- Excavator with thumb;
- Excavator with straight edge bucket;
- Multiple 10-wheel truck or off-road trucks;
- Water truck, all wheel drive;
- Drop tank for water;
- Loader;
- Dozer, D-6; and
- Dozer, D-6 LGP.

4.3.2 Structures and Equipment Removal and Staging

Mining-related structures, equipment, soil, and debris will be removed, if required, from the work area during the project. As structures are removed from each mine area the material will be transported to the staging area, stockpiled, and consolidated for disposal. Mining-related debris encountered between the staging area and the target mine areas will also be evaluated for removal, as described in Section 3.1. This includes man-made wood products and steel.

If required, the removal of former mining structures is anticipated to be completed with an excavator with thumb with minor cutting. If hot work is need to dismantle steel structures a separate Job Hazard Analysis form will be completed and included in the project HASP.

Debris will be sorted by type (i.e., brick/concrete, wood, and metal). Based on available characterization data, brick and concrete debris will be disposed off at a recycling facility, wood either recycled or disposed of as construction material, and steel will be recycled. If processing equipment is determined to be Group A waste, then a separate containment area in the staging area will be created specifically for those wastes. This waste will be transported to an appropriate facility within 90 days of accumulation, or prior to the end of the construction season, whichever comes first. Debris and materials to be recycled will be sent off site as a full load is generated or the end of the project to minimize expenses.
4.3.3 Waste Rock, Tailings, Ore, and Soil Removal, Segregation, and Staging

Waste rock, tailings, ore, and soil will be removed from the Site using a systematic approach. Excavators will be used to segregate the material based on material characterization data and field observations as the material is placed into haul trucks. The material will be removed using a straight edge bucket working from the outside edges of dumps and piles inward. The process will minimize the mixing of native material with the tailings, the over excavation of material, and the spreading of material into adjacent creeks and clean areas. To the extent possible, work will proceed from the furthest location of the mine back toward the staging area.

Material will be loaded directly into bulk transporters or into on-Site trucks where access is limited. Materials that are loaded onto on-Site trucks will be stockpiled in the staging area for loading into bulk carriers for transport to the final disposal or processing destination.

4.3.4 On-Site Management of Mining-Related Materials

As mentioned previously, not all of the mining-related material will require removal and disposal off Site. Mining-related materials meeting Group C requirements will be managed in accordance with Group C requirements and may be reclaimed in place. The existing waste rock at the Central Mine site has been sampled, tested, and is classified as a Group C mining waste. This material will not be removed, but will be reclaimed in place.

Inspection has revealed that the surface of the existing waste rock pile contains a pocket against the existing highwall that is capable of accepting additional (Group C) mining-related materials. The capacity of this “pocket” is estimated to be on the order of 9,000 cy. Any additional Group C material encountered at other locations on-Site can be transported to the Central Mine area and placed on the existing waste rock pile to be reclaimed on-Site, up to the estimated total capacity.

The mining-related material will be spread in thin lifts and compacted using equipment traffic. The final surface shall be graded to match surrounding surface, have positive drainage, and then seeded with the approved upland seed mix to revegetate the finished surface.

4.3.5 Transportation Plan

A Preliminary Site Transportation Plan was prepared to identify potential health and safety risks resulting from on- and off-site movement of
materials, equipment, and debris. The preliminary transportation plan outlines appropriate procedures and precautions that will be taken to minimize potential risks, and will be modified during the project to reflect changing conditions, improved procedures, and expanded scope, as needed, including additional off-site disposal locations.

4.4 SITE RESTORATION DESIGN

This section describes the Site restoration design, including required equipment, temporary road removal, regrading and slope stabilization, and revegetation.

4.4.1 Required Equipment

Equipment required for Year 1 Site restoration may include the following:

- Water truck, all wheel drive;
- Dozer, D-6, with rippers; and
- Hydro seeder.

4.4.2 Restoration of Temporary Roads

All temporary roads used or constructed as part of this project will be removed when a construction is completed. Using excavating equipment and starting at the furthest extent of the access road, the roadway shall be graded to match existing grade and contour as the equipment “backs out” of the access road alignment. Area shall be graded such that no ponding of storm water will occur and seeded with the approved seed mix to re-establish the vegetative cover (see Figures 4-1 and 4-2 for steep slopes and flat terrain, respectively). Restoration activities will include:

- Removal of culverts installed for creek crossings;
- Removal of signs or markers installed during mobilization;
- Removal of new temporary bridges, anchor blocks, and support blocks in creek;
- Replacement of stone where bridge support blocks were removed;
- Rip the soil compacted during road construction to facilitate re-vegetation;
- Re-grade the road location to minimize visual evidence of the road;
- Re-grade to minimize run-off and erosion, per Sections 4.4.3 and 4.4.4; and
• Re-vegetate area per Section 4.4.5.

At locations where the roadway prism crosses a drainage, existing structures will be removed and the channel bed re-established, if necessary. The new channel should match the existing channel grade and the new channel armored with D50 = 4 inch graded riprap.

4.4.3 Regrading and Slope Stabilization

The restoration of disturbed areas and temporary roads will be completed by grading the area to blend with the surrounding grades and natural slopes to the extent practicable. Areas that have been compacted and abandoned will be graded and/or ripped to facilitate vegetation growth. All slopes and graded areas will minimize channeled storm water run-off and erosion. Stream bed slope and path will be protected during re-grading.

Slopes will be stabilized by track rolling with the dozer, will comply with storm water BMPs, and will be finished with hydro seeding per the re-vegetation plan. For areas requiring fill along slopes, the material will be keyed in and compacted.

Where appropriate, grass filters may be employed to facilitate stabilization and mitigate sediment runoff to the creek. A grass filter is essentially a vegetated buffer zone lying on the flat to gently sloping terrace surface between the toe of the slope and the top of the main channel bank. The vegetation slows the velocity of sediment laden runoff causing the sediment to deposit on the surface within the limits of the vegetation coverage before reaching the edge of the stream bank. It relies on a high cover density of grass or grass-like vegetation (a dense cover of weeds will also be effective). The grass filter can be formed either by preserving an existing stand of dense vegetative cover (i.e., leaving a buffer zone) or by re-establishing a dense vegetative cover on a newly disturbed surface.

4.4.4 Potential Channel Sediment Controls at Wide Awake

As discussed with the CVRWQCB, removal of the mining-related waste rock in the very bottom of the existing channel in the Wide Awake Mine area may be difficult and result in greater potential impacts to the creek from the removal activities. As such, some material may remain trapped in inaccessible areas of the channel floor (among boulders and in pools and pockets along the channel floor). If the estimated volume trapped is sufficiently small, then no additional measures to mitigate potential downstream sedimentation shall be deemed necessary. However, if the
trapped volume is of sufficient quantity\(^5\), then a temporary rockfill sediment dam structure may be constructed as a temporary collection measure.

It is proposed that the sediment dam would be operated in the channel downstream of the Wide Awake area to detain and facilitate the removal of the trapped materials over a period of up to five (5) years. A proposed design plan for the rockfill sediment dam is provided in Appendix G.

If the construction of the rockfill sediment dam is warranted, Homestake will include this activity as part of the restoration activities. However, any inspections, maintenance and final removal will be the responsibility of other Dischargers, identified by CVRWQCB.

4.4.5 Stream Stabilization near Manzanita

Expected disturbance on a portion of the Manzanita Mine lies directly above a section of the main channel of Sulphur Creek that is an outside meander bend and is actively migrating toward the base of the slope. Should the erosion associated with the meander bend reach the toe of the slope, it could result in significant instability in the slope above the channel delivering sediment, (potentially from mining-related material) directly to the creek channel. As a mitigation measure, the installation of a self-deploying riprap barrier is proposed. The purpose of the self deploying riprap barrier is to arrest the lateral migration of the channel before it reaches the toe of the slope without constructing a hard structure within the active channel.

Once erosion of the channel bank reaches the edge of the barrier, it will undermine and expose the riprap filled trench causing the rock to fall into the edge of the channel forming an angle of repose slope of coarse rock that inhibits any further migration toward the toe of the slope. A typical detail diagram of a self-deploying riprap barrier is provided as Figure 4-3.

\(^5\) Based on the limited topographic information and the Site inspection performed, the preliminary trigger amount is estimated to be 20 CY of in place material. This estimate considers the space available in which to construct a sediment pond in the drainage, as well as the effective amount of sediment that could be collected and removed from the pond. This estimate will be re-evaluated during the remediation activities at the Wide Awake area.
4.4.6 Revegetation

The preliminary Revegetation Plan is attached as Appendix F of this Work Plan. A summary of the Revegetation Plan is provided here; however for complete details refer to Appendix F.

As agreed between the CVRWQCB and Homestake, Homestake will be responsible for the initial broadcast seeding of early succession stage native herbaceous grasses and/or forbs. Accordingly, this Work Plan focuses on Year 1, Seeding of Early Succession Herbaceous Grasses and/or Forbs. Other Dischargers identified by CVRWQCB will be responsible for the Post Year 1 revegetation monitoring and activities.

Key features of the Revegetation Plan include:

- Phased approach;
- Location and areal extent;
- Seed mixes;
- Seeding schedule;
- Evaluate the effectiveness of the restoration; and
- Monitor to verify the effectiveness of the restoration.

The location and areal extent of Year 1 vegetation restoration efforts are specified on a mine-by-mine basis in Section 3 of the Revegetation Plan. An overview of the restoration plan is provided in Table 4-1. The Year 1 decision framework is shown in Figure 4-4.

Based on Year 1 verification monitoring data for a particular area, if the Year 1 performance-based triggers are:

- Achieved — then Year 1 restoration actions are complete and no further Year 1 restoration actions are necessary.
- Not achieved — then additional seeding effort using native herbaceous grasses and/or forbs will be conducted.

Re-vegetation of the restored areas will be completed prior to the beginning of the wet season (Fall 2011). Appropriate seed mixes will be applied as described in the Revegetation Plan. As requested by the CVRWQCB, the Revegetation Plan also describes the proposed monitoring and performance criteria for Post Year 1 activities that will be the responsibility of other Dischargers as identified by CVRWQCB.
4.5 **EQUIPMENT DECONTAMINATION**

Equipment decontamination will occur anytime a piece of equipment or truck that was in contact with contaminated material leaves a specific mine area (boundaries to be determined in the field) or the Site. Mine area and staging area decontamination will be conducted in accordance with the following procedures:

- Contaminated material will be knocked off all equipment tracks and or tires prior to leaving work area;
- Bulk transporters or on-site trucks will load in a single area outside of the contaminated zone to prevent material from being tracked out;
- Bulk transporters and in-site trucks will keep loads below the rail and will clean rails prior to proceeding on haul road; and
- Support vehicles will not enter contaminated zones.

Equipment and or trucks leaving the project Site will adhere to the following procedures:

- Equipment will be decontaminated in the staging area prior to leaving the Site. The bid specifications will include specific demobilization decontamination procedures.
- Bulk transport trucks will verify that rails and fenders of trucks are clear of soil and that tires are clean prior to leaving staging area. Knock off pads will be constructed if necessary.
- Pickup trucks leaving the site will have clean tires prior to leaving the site on the access road.
- All vehicles leaving the property will have clean tires prior to entering Highway 20. Knock off pads will be constructed if needed.

4.6 **GEOLOCATION**

The limits of removal actions at each mine site will be photo-documented in the field and will be geolocated using a portable GPS unit. The GPS data will be used to develop as-build maps of the construction effort using the existing project base map, and will be augmented by a series of before-and-after photographs of each work area.
4.7 RECORDKEEPING

This section describes recordkeeping procedures that will be followed during the removal and restoration activities at the Site, including daily field notes, the project permit book, and field and laboratory material characterization activities.

4.7.1 Daily Field Notes

Daily field notes, consisting of the following forms, will be produced during Site removal and restoration activities:

- **Daily tailgate form** – The daily tailgate form will document the days planned activities, safety discussions, and all site visitors signed in and out of the site (form included in project HASP).

- **Field log** – The field log will document site activities, work completed, volumes excavated, materials leaving the site, phone log, and decisions made in the field.

- **Air monitoring log** – Real time air monitoring and dust monitoring will be recorded daily (log included in the project HASP).

- **Off-site truck log** – Off-site truck logs will contain the date, time, truck, material leaving the site and the manifest for the load. It will be paired with a receiving log for any landfilled materials at the McLaughlin Mine or a manifest receipt for materials disposed off-site.

- **Photo log** – Photo logs will be digital images of the progress of work throughout the day. Overall Site photos as well as detailed photos will be organized chronologically and maintained electronically.

All of the site daily field notes will be kept by the Construction Manager during Site construction activities, and will be provided to the Project Manager following completion of construction, for placement into the project file.

4.7.2 Permit Book

A record of all project approvals and permit conditions will be created as they are obtained and a “Permit Book” will be developed that contains all certified and signed permissions and exemptions, and a complete list of conditions and BMPs that are to be adhered to during construction. A hard copy of the Permit Book will remain on Site during construction, and copies will be distributed to appropriate Homestake and contractor leads.
Following completion of removal and restoration activities, the Permit Book will be incorporated into the project file by the Project Manager.

### 4.7.3 Field and Laboratory Material Characterization Data Management

Although not anticipated, if additional mining-related materials are identified during the removal action, additional field and laboratory characterization data may be collected. All additional characterization data will be reviewed for acceptability and entered into the project database. Procedures related to field and laboratory data management are provided in the SAP (Appendix C).

Data generated in the field may include field log book entries, sample dates, field parameter measurements, observations, and additional information (such as field duplicate number). These data will be manually entered into an electronic format, and then checked by a second person, before final inclusion in the database. Following review and acceptance, analytical data generated by the subcontract laboratories will be obtained as an electronic data deliverable for import into the project database.
5.0 PROJECT SCHEDULE

The project schedule is dependent upon timely approval by CVRWQCB of this Work Plan. It is anticipated that Homestake will receive approval of this plan within 45 calendar days of submittal. The project schedule also requires landowner agreements.

Permitting and planning activities for the remediation project will begin during the fall of 2010. Site mobilization and construction tasks are planned to be completed during the dry season of 2011 (1 April through 15 October 2011) with revegetation/restoration activities continuing through the fall season. It is anticipated that a Mining-Related Materials Remediation Completion Report will be submitted within 3 months after the completion of all field efforts at the Site.

The above schedule assumes that all Site activities will satisfy requirements for categorical exemption from CEQA review. If certain activities require CEQA action, the above schedule will need to be revised to include CEQA review and reporting.
6.0 REFERENCES


CVRWQCB, 2010a. Transmittal from Mr. Victor Izzo to Dischargers, entitled SUBMITTAL OF WORK PLAN, SULPHUR CREEK MINING DISTRICT, CENTRAL GROUP AND WIDE AWAKE MINES, dated 3 August.

CVRWQCB, 2010b. Transmittal from Mr. Victor Izzo Dischargers, entitled WORK PLAN COMMENTS, SULPHUR CREEK MINING DISTRICT, CENTRAL GROUP, dated 3 August.


ERM. 2009. DRAFT Preliminary Conceptual Site Model for Sulphur Creek Mining District Sulphur Creek Mining District, Colusa County, CA.

ERM 2010. Sampling and Analysis Plan for Mining-Related Waste Characterization

Foe, C. and Croyle, W., 1998, Mercury Concentrations and Loads from the Sacramento River and from Cache Creek to the Sacramento-San
Joaquin Delta Estuary, California Regional Water Quality Control Board, Central Valley Region, 101 p


Watts, W.L., 1893, Colusa County, Eleventh Report of the State Mineralogist, California State Mining Bureau, Sacramento, CA, pp. 183-184.
Figures
Sulphur Creek Mining District
Colusa County, California

FIGURE 2-6
NWI WETLANDS
AND CNDDDB MAP

Prepared by
MKJ (ERM)

Extent Covers Entire Map
NWI Wetland Codes: http://www.fws.gov/wetlands/Data/wetlandcodes.html
FIGURE 3-1
PROPOSED ON-SITE TRANSPORTATION ROUTES AND STREAM CROSSINGS

Sulphur Creek Mining District
Colusa County, California

JOB No. 0108205
FILE: GIS/BARRICK/SCMD/FIGURE 3-1.MXD
Date
04/28/10

FIGURE 3-1
PROPOSED ON-SITE TRANSPORTATION ROUTES AND STREAM CROSSINGS

Prepared by MKJ (ERM)

500 0 500
250
Feet

Mine Site
Material Feature*
Existing Road
Waterbody
Major Contour
Minor Contour
Vegetation
Utilities

Transportation Routes
Main Site Access Road
Internal Haul Road, Existing/Rehab
Internal Haul Road, New Construction
Planned At-Grade Stream Crossing
Planned Temporary Bridge
Proposed Stream Erosion Barrier

Mine
CE - Central Mine
CH - Cherry Hill Mine
MA - Manzanita Mine
WA - Wide Awake Mine
WE - West End Mine

Material
CO - Concrete
CT - Calcine Tailings
RT - Retort/Furnace
SC - Scree
WR - Waste Rock
WS - Serpentinite Waste Rock

*Dashed = Approximate Extent of Scree
Figure 3-2

Railroad Flatcar Bridge
(Typical Detail)

Sulphur Creek Mine Related Remediation Project
Homestake Mining Company of California
Colusa County, California

*NOTE: DIMENSIONS OF BRIDGE AND WIDTH OF CREEK WILL VARY AND BE FINALIZED DURING BID PROCESS.*
Figure 4-1: Access Road Reclamation – Steep Slope Locations

TYPICAL DETAIL FOR ACCESS ROAD RECLAMATION - STEEP SLOPE LOCATIONS
NTS

Treatment on Steep Slopes

Regrade the roadway surface to slope outward 3% to 50% and revegetate with approved upland seed mix.

Treatment at Drainages and Swales

Transition regraded slopes to match existing grades at drainages and swales

Re-establish channel using D50 = 4” graded riprap
Figure 4-2: Access Road Reclamation – Flat Ground Locations

Typical Detail for Access Road Reclamation - Flat Ground Locations

NTS

Treatment between Drainages and Swales

Regrade the roadway surface to match the existing grade sufficiently to prevent the interception and diversion of surface water and revegetate with approved upland seed mix.

14 ft Typical

Treatment at Drainages and Swales

Remove any culverts or other drainage structures

Match existing grades at drainages and swales.

Re-establish channel using D50 = 4” graded riprap
Figure 4-3: Self Deploying Riprap Barrier

TYPICAL DETAIL FOR SELF DEPLOYING RIPRAP BARRIER

D50 = 12 in. Graded Riprap

Topsoil/Growth Medium

6 in. Min.

10 ft Min.

Min. of one excavator bucket width

6 ft Min.

Existing streambed and oversteepened bank

Slopes as required for safe construction
Figure 4-4. Vegetation Restoration Plan Decision Framework

Homestake

Year 1
Seed Early Succession Grasses/Forbes

Year 1
Verification Monitoring

Meet Performance Goals?

N = 2

Exit

Other Named Dischargers

Year N
Restoration

Year N
Verification Monitoring

Meet Year N Performance Goal?

Y

Exit Year N

N ≤ 5 years?

N

Exit

Y

N = N + 1

N
Tables
<table>
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<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Federal Listing Status</th>
<th>State Listing Status</th>
<th>Global Rank</th>
<th>Other Status</th>
<th>Habitat</th>
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<td>&lt;b&gt;Corynorhinus townsendii&lt;/b&gt;</td>
<td>Townsend’s big-eared bat</td>
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<td>None</td>
<td>G4</td>
<td>S2,S3</td>
<td>BLM S-Sensitive</td>
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<td>&lt;b&gt;Falco mexicanus&lt;/b&gt;</td>
<td>Prairie falcon</td>
<td>None</td>
<td>None</td>
<td>G5</td>
<td>S3</td>
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<td>&lt;b&gt;Lupinus sericeus&lt;/b&gt;</td>
<td>Cobb Mountain lupine</td>
<td>None</td>
<td>None</td>
<td>G2</td>
<td>S2.2</td>
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<td>&lt;b&gt;Paracoenia calida&lt;/b&gt;</td>
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<td>S1</td>
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<td>&lt;b&gt;Rana boylii&lt;/b&gt;</td>
<td>Foothill yellow-legged frog</td>
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<td>Big-scale balsamroot</td>
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<td>None</td>
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<td>BLM S-Sensitive</td>
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<td>S3</td>
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<td>None</td>
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<td>None</td>
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<td>Deep-scarred cryptantha</td>
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<td>&lt;b&gt;Didymodon norrisii&lt;/b&gt;</td>
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<td>None</td>
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Notes:
- California Native Diversity Database (CNDDB) located at http://imaps.dfg.ca.gov
- Project Area = Sulphur Creek Mining District – Wide Awake Mine and Central Mine Group (see Figure 2-5)
- Greater Sulphur Creek Region = Within an approximate 2 mile radius outside of the Project Area
- State Rank reflects condition (rarity and endangerment) of an element within the State of California. Ranks may be combined to indicate a range, e.g. S1S2.
- Global Rank reflects overall condition (rarity and endangerment) of an element throughout its range. Ranks are assigned by the CNDDB biology staff following review of all available information.
  - G1 = Less than 6 Element Occurrences (EO) OR less than 1,000 individuals OR less than 2000 acres
  - G2 = 6 - 20 EOs OR 1,000 - 3,000 individuals OR 2,000 - 10,000 acres
  - G3 = 21 - 100 EOs OR 3,000 - 10,000 individuals OR 10,000 - 50,000 acres
  - G4 = Apparently secure; this rank is clearly lower than G3 but factors exist to cause some concern; i.e. there is some threat, or somewhat narrow habitat.
  - G5 = Population or stand demonstrably secure to ineradicable due to being commonly found in the world.
- California State listing status; State of California legal status
- California Native Plant Society (CNPS) List. This field applies to plants only.
  - 1A = Plants presumed extinct in California
  - 1B = Plants rare, threatened, or endangered in California and elsewhere
  - 2 = Plants rare, threatened, or endangered in California, but more common elsewhere
  - 3 = Plants about which we need more information - a review list
  - 4 = Plants of limited distribution - a watch list
  - BLM = Bureau of Land Management
  - DFG = California Department of Fish and Game (CDFG)
  - IUCN = International Union for Conservation of Nature
  - USFS = United States Forest Service
  - WBWG = Western Bat Working Group

Page 2 of 2
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<tr>
<th>Location</th>
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<th>Description</th>
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<th>Leachable Metals by CalWET Analysis</th>
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<td></td>
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<td>Mercury (µg/L)</td>
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<td>NA</td>
<td>2.7</td>
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<td>MAN-3</td>
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<td>Toe of east dump</td>
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Notes:
- Shaded cells indicate concentrations greater than the TTLC (solid) and STLC (leachate) regulatory limits
- µg/L = Microgram per liter
- mg/kg = Milligrams per kilogram
- NA = Not analyzed
- CalWET - California Waste Extraction Test
- CCR = California Code of Regulations
Table 2-3
Summary of Mine-Related Source Waste Characterization Results
Central Mine Group and Wide Awake Mines
Sulphur Creek Mining District
Colusa County, California

Figure Location

Sample Location

Central Mine

Central Mine Group Area

Cherry Hill Mine

Manzanita Mine

West End Mine

Wide Awake Area

Wide Awake Mine

Sample Number

Data Source

Sample Description

Waste Source

Bevill
Exempt?

CEN-1

C and C, 2003

Soil near retort site

beneficiation

Yes

CE-RT1-BR-01

ERM Sampling March 2010

Brick from retort CE-RT

beneficiation

Pending

CE-RT1-CE-01

ERM Sampling March 2010

Ceramic from retort CE-RT

beneficiation

Pending

CEN-2
CEN-3

C and C, 2003
C and C, 2003

Calcine tailings near retort
Field duplicate of CEN-2

beneficiation
beneficiation

CE-CT-C1

ERM Sampling March 2010

Calcine tailings at CE-CT1

beneficiation
beneficiation

CE-CT-C2

ERM Sampling March 2010

Calcine tailings at CE-CT2

CEN-4
CEN-4
CEN-19F

C and C, 2003
C and C, 2003
C and C, 2003

Upper dump
Lab duplicate
Dump material

extraction
extraction
extraction

CE-WR-C3

ERM Sampling March 2010

Waste rock at CE-WR

CE-WR-C4

ERM Sampling March 2010

CH-1

C and C, 2003

CH-WR-C1

ERM Sampling March 2010

Waste rock at CE-WR
Small pile on west side of mine
area
Small pile between concrete
structures
Soil sample geothermal
exploration well area
Composite of piles at CH-WR

CH-2

C and C, 2003

CH-4

C and C, 2003

CH-CO-C1

ERM Sampling March 2010

Composite of concrete

MANZ

TetraTech 2003

MA-WR-C1

ERM Sampling March 2010

Waste rock below adit
Scree from "bleached" zone MASC1

MAN-10

C and C, 2003

Sediment at cut face of first bench

Yes

CE-RT (soil)
CE-RT

CE-CT1

Total
Sulfides

pH
Std Units

(mg/kg)

Total Metals Total Metals

Leachable
Metals by
CalWET
Analysis

Mine Waste
Group
Classification/ Ore

NA

NA

Gold
(oz/ton)
NA

NA

NA

NA

0.33

ND

Group C

NA

NA

NA

34

ND

Group B

NA
NA

NA
NA

0.0006
NA

30
30

NA
NA

Group B

NA

NA

NA

NA

ND

Mercury
(mg/kg)
420

Mercury
(ug/L)
NA

(see text Section
2.4.1)
Group B

CE-CT2

NA

NA

NA

NA

ND

Group C

CE-WR

NA
NA
NA

NA
NA
NA

NA
NA
NA

2.42
4.15
10

NA
NA
NA

Group C

extraction

NA

NA

NA

NA

ND

extraction

NA

NA

NA

NA

ND

extraction

NA

NA

NA

220

NA

NA

NA

NA

47.2

NA

NA

NA

NA

57

NA

ND

7.39

0.0236

NA

ND

NA

NA

NA

1.1

ND

extraction

Yes

Location/
Material Designation
(see Figure 2-8)

Yes

Yes

CH-WR

extraction
extraction
beneficiation

Pending

CU-CO

Yes

MA-SC1

Yes

MA-SC2

Yes

MA-SC3

extraction

NA

NA

NA

NA

2.7

ND

2.68

0.021

NA

ND

NA

NA

NA

130

NA

NA

NA

NA

130

NA

ND

3.78

0.187

NA

ND

ND

4.08

0.158

NA

ND

NA
NA
NA
NA

NA
NA
NA
NA

NA
0.731
NA
NA

NA
290
300
84.4

204
NA
NA
NA

ND

4.96

0.174

NA

ND

extraction

ND

5.69

0.142

NA

ND

extraction
beneficiation

Group B

Group C
Group C

Ore

MAN-11

C and C, 2003

Duplicate of MAN-10

beneficiation

MA-WR-C2

ERM Sampling March 2010

Scree from darker rock at MA-SC2

beneficiation

MA-WR-C3

ERM Sampling March 2010

Scree from MA-SC3

beneficiation

WE
WE-1
WE-2
WS-WE001-1120309

TetraTech 2003
C and C, 2003
C and C, 2003
Homestake Sampling 2009

WE-WR-C1

ERM Sampling March 2010

WE-WR-C1D

ERM Sampling March 2010

WE-WR-C2

ERM Sampling March 2010

extraction

ND

4.93

> 0.292

NA

ND

WAT-1
WA-4
WA-7
WA-8
WA-9

TetraTech 2003
C and C, 2003
C and C, 2003
C and C, 2003
C and C, 2003

Waste rock near Sulfur Creek
Waste rock
Waste rock
Toe of east dump
Waste rock below east adit at WEWR
Waste rock below east adit at WEWR
Waste rock below west adit at WEWR
Tailings below brick retort
Calcined tailings
Calcine tailings
Duplicate of WA-7
Calcine tailings

beneficiation
beneficiation
beneficiation
beneficiation
beneficiation

NA
NA
NA
NA
NA

NA
NA
NA
NA
NA

NA
0.06
0.028
0.033
0.061

NA
30
10
20
40

0.17J
NA
NA
NA
NA

WA-CT-C3

ERM Sampling March 2010

Calcine tailings from WA-CT1

beneficiation

ND

9.25

0.046

NA

ND

WA-CT2 (soil)

NA

NA

NA

1,040

NA

Group B

WA-CT2

NA

NA

NA

NA

110

Group C

Yes

WA-CT3

NA

NA

NA

NA

ND

Group C

NA

NA

NA

NA

0.85

Yes

WA-WS

NA

NA

NA

60

NA

ND

8.70

0.01

NA

ND

WA-15

C and C, 2003

WA-RT5-ASH-02

ERM Sampling March 2010

WA-CT-C4

ERM Sampling March 2010

WAWR

TetraTech 2003

Soil from under condenser
building
Calcine tailings at WA-CT2

WA-3

C and C, 2003

Calcine tailings at WA-CT3
Waste rock from vicinity of 1940s
rotary furnace
Green waste rock pile

WA-WS-C2

ERM Sampling March 2010

Serpentinitic waste rock at WA-WS

extraction
extraction
extraction
extraction
extraction

beneficiation

Yes

Yes

Yes

beneficiation
beneficiation

WE-WR

WA-CT1

beneficiation
extraction
extraction

Page 1 of 2

Ore

Ore

Group B

Group B


Table 2-3
Summary of Mine-Related Source Waste Characterization Results
Central Mine Group and Wide Awake Mines
Sulphur Creek Mining District
Colusa County, California

<table>
<thead>
<tr>
<th>Location/ Material Designation</th>
<th>Total Metals Total Metals Leachable Metals by CalWET Analysis</th>
<th>Mine Waste Group Classification/Ore</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gold (ppm) Mercury (mg/kg) Metal (mg/kg)</td>
<td>Gold (ppm) Mercury (mg/kg) Metal (mg/kg)</td>
</tr>
<tr>
<td></td>
<td>CalWET - California Waste Extraction Test</td>
<td>CalWET - California Waste Extraction Test</td>
</tr>
<tr>
<td></td>
<td>CTC - Central CTC - Calpine tailings SC = Screws</td>
<td>CTC - Calpine tailings SC = Screws</td>
</tr>
<tr>
<td></td>
<td>CT = Concrete MA = Mercuria</td>
<td>CT = Concrete MA = Mercuria</td>
</tr>
<tr>
<td></td>
<td>CS = Calpine CS = Concrete MA = Mercuria</td>
<td>CS = Calpine CS = Concrete MA = Mercuria</td>
</tr>
<tr>
<td>Total Threshold Limit Concentration/ Soluble Threshold Limit Concentration</td>
<td>California Hazardous Waste Criteria, CCR Title 22, section 6201.24</td>
<td>California Hazardous Waste Criteria, CCR Title 22, section 6201.24</td>
</tr>
<tr>
<td>Gold Reclamation Processing Facility Minimum Gold Ore Grade</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

Notes:
- Gray-shaded cells indicate concentrations greater than the TTEC (solid) or STLC (leachate) regulatory limits
- Yellow-shaded cells indicate samples with gold content above minimum grade for ore
- Materials pending waste classification/Bevill exemption interpretation
- mg/kg = Milligrams per kilogram
- ppm = parts per million
- NA = Not analyzed or not applicable

Bibliography:
Table 2-4
Mining-Related Materials Inventory
Central Mine Group and Wide Awake Mines
Sulphur Creek Mining District
Colusa County, California

<table>
<thead>
<tr>
<th>Mine Area</th>
<th>Mine Waste Description</th>
<th>Approx. Volume for Management (cubic yards)</th>
<th>Location/Material Designation (see Figure 2-8)</th>
<th>Material Designation</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central</td>
<td>Rotary furnace/brick retort</td>
<td>100</td>
<td>CE-RT</td>
<td>Group B Waste</td>
<td>Steel, wood, brick, and ceramic construction.</td>
</tr>
<tr>
<td></td>
<td>Calcine pile - east</td>
<td>100</td>
<td>CE-CT1</td>
<td>Group B Waste</td>
<td>Calcine tailings pile near former retort/furnace.</td>
</tr>
<tr>
<td></td>
<td>Calcine pile - west</td>
<td>17,800</td>
<td>CE-WR</td>
<td>Group C Waste</td>
<td>Calcine tailings pile west of drainage near former retort/furnace.</td>
</tr>
<tr>
<td></td>
<td>Waste rock pile</td>
<td></td>
<td>Near CE-CT2</td>
<td>Uncontaminated Material¹</td>
<td>Bench of waste rock adjacent to highwall mining area.</td>
</tr>
<tr>
<td></td>
<td>West retort site</td>
<td></td>
<td></td>
<td></td>
<td>Steel &amp; wood debris, rails, hopper car, drums</td>
</tr>
<tr>
<td>Cherry Hill</td>
<td>Small pile</td>
<td>400</td>
<td>CH-WR</td>
<td>Group B Waste</td>
<td>Three small waste rock piles near adit portals and a possible geothermal exploration drill pad along bank of Sulphur Creek.</td>
</tr>
<tr>
<td></td>
<td>Small pile</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Medium pile</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Waste pile along creek</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manzanita</td>
<td>Scree (bleached) - east area</td>
<td>1,600</td>
<td>MA-SC1</td>
<td>Group C Waste</td>
<td>Surficial rock debris (scree) on cliff face near mine workings.</td>
</tr>
<tr>
<td></td>
<td>Scree (unbleached) - east area</td>
<td>3,800</td>
<td>MA-SC2</td>
<td>Gold Ore</td>
<td>Surficial rock debris (scree) on cliff face near mine workings.</td>
</tr>
<tr>
<td></td>
<td>Screen - west area</td>
<td></td>
<td>MA-SC3</td>
<td>Gold Ore</td>
<td>Surficial rock debris (scree) on hillside near mine workings.</td>
</tr>
<tr>
<td>West End</td>
<td>Waste rock pile</td>
<td>4,200</td>
<td>WE-RR</td>
<td>Gold Ore</td>
<td>Cone-shaped pile adjacent highwall and three adits.</td>
</tr>
<tr>
<td>Wide Awake</td>
<td>Brick retort</td>
<td>50</td>
<td>WA-RT1</td>
<td>Group C Waste</td>
<td>Brick furnace on top/back side of WA-CT1</td>
</tr>
<tr>
<td></td>
<td>Brick retort</td>
<td>10</td>
<td>WA-RT2</td>
<td>Group C Waste</td>
<td>Brick furnace on back side of WA-RR2 (overburden pile)</td>
</tr>
<tr>
<td></td>
<td>Rotary furnace</td>
<td>40</td>
<td>WA-RT3</td>
<td>Group B Waste</td>
<td>Main retort north of WA-WS, Steel, concrete, brick, and wood construction</td>
</tr>
<tr>
<td></td>
<td>Scott furnace</td>
<td>430</td>
<td>WA-RT4</td>
<td>Group C Waste</td>
<td>Scotts Furnace, Brick construction</td>
</tr>
<tr>
<td></td>
<td>Brick-retort</td>
<td>120</td>
<td>WA-RT5</td>
<td>Group C Waste</td>
<td>Small brick furnace on top of Scotts Furnace</td>
</tr>
<tr>
<td></td>
<td>Brick and stone retort</td>
<td>30</td>
<td>WA-RT6</td>
<td>Group C Waste</td>
<td>Brick and dimension sandstone construction</td>
</tr>
<tr>
<td></td>
<td>Brick retort</td>
<td>110</td>
<td>WA-RT7</td>
<td>Group C Waste</td>
<td>Brick furnace across stream from Wide Awake mine sites</td>
</tr>
<tr>
<td></td>
<td>Steel pipes and metal debris</td>
<td></td>
<td>Scattered in WA area</td>
<td>Uncontaminated Material¹</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Waste rock pile - north</td>
<td>11,600</td>
<td>WA-WR1</td>
<td>Group B Waste</td>
<td>Northern pile of waste rock on edge of stream</td>
</tr>
<tr>
<td></td>
<td>Nonserpentinic waste rock in south pile</td>
<td>7,500</td>
<td>WA-WR2</td>
<td>Group B Waste</td>
<td>Bench of waste rock adjacent to WA-CT1 and stream</td>
</tr>
<tr>
<td></td>
<td>Calcine portion of south pile</td>
<td>2,900</td>
<td>WA-CT1</td>
<td>Group B Waste</td>
<td>Calcine tailings pile adjacent to WA-WS and stream</td>
</tr>
<tr>
<td></td>
<td>Small pile of calcine</td>
<td>10</td>
<td>WA-CT2</td>
<td>Group C Waste</td>
<td>Calcine tailings on top of Scotts Furnace next to retort WA-KT3</td>
</tr>
<tr>
<td></td>
<td>Small pile of calcine</td>
<td>20</td>
<td>WA-CT3</td>
<td>Group C Waste</td>
<td>Calcite used as fill southwest of WA-KT4, across creek</td>
</tr>
<tr>
<td></td>
<td>Serpentinitic waste rock in south pile</td>
<td>7,900</td>
<td>WA-WS</td>
<td>Group B Waste</td>
<td>Serpentinitic waste rock under and behind mine workings and along edge of stream</td>
</tr>
<tr>
<td></td>
<td>Small pile of calcine and ash</td>
<td>60</td>
<td>WA-ASH1</td>
<td>Group C Waste</td>
<td>Pink-gray colored ash in front of WA-KT3</td>
</tr>
</tbody>
</table>

Summary:
- Volume for Removal/Disposal = 30,540
- Volume for Removal/Disposal = 840
- Volume Gold Ore = 17,800

Notes:
- ¹Material to be removed for aesthetic reasons
- Assumes material will be recycled
- pending waste classification/Bevill exemption interpretation
- To be managed in place as Group C material

Materials:
- CE - Central Mine
- CH - Cherry Hill Mine
- MA - Manzanita Mine
- WA - Wide Awake Mine
- WE - West End Mine
- CT - Calcine Tailings
- CO = Concrete
- RT - Retort/Furnace
- SC - Scree
- WR - Waste Rock
- WS - Serpentinite Waste Rock

Estimated volumes for removal and management (rounded up)
### Table 3-1
**List of Anticipated Permits and Approvals**  
**Sulphur Creek Mining District**  
**Colusa County, California**

<table>
<thead>
<tr>
<th>Agency</th>
<th>Permit Name</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. Army Corps of Engineers (USACE) – Sacramento District</td>
<td>Section 404/10 Nationwide Permit</td>
<td>If Nationwide will apply, most likely permit is NWP #38 - Cleanup of Hazardous and Toxic Waste. Desktop file review and delineation of affected special aquatic sites, including wetlands to be conducted.</td>
</tr>
<tr>
<td>U.S. Department of Interior, Bureau of Land Management (BLM)</td>
<td>Land Use Permit; Right-of-Way</td>
<td>Related to temporary roads needed across BLM land.</td>
</tr>
<tr>
<td>Advisory Council for Historic Preservation/California State Department of Parks and Recreation</td>
<td>National Historic Preservation Act (NHPA) Section 106, Consultation</td>
<td>Will depend on results from Cultural/Archeological file review and/or pedestrian survey.</td>
</tr>
<tr>
<td>US Fish and Wildlife Services (USFWS)</td>
<td>Endangered Species Act Section 7, Consultation.</td>
<td>CNDDDB File &amp; Map Review indicates that there are no Federal or State listed species in project area. Desktop file review of “sensitive” species to be conducted.</td>
</tr>
<tr>
<td>Central Valley Water Quality Regional Control Board (CVRWQCB)</td>
<td>Section 401 Water Quality Certification</td>
<td>Potentially exempt from 401 Water Quality Certification if project is covered by NWP #38 for Cleanup of Hazardous and Toxic Wastes.</td>
</tr>
<tr>
<td>Central Valley Water Quality Regional Control Board (CVRWQCB)</td>
<td>General Stormwater Construction Permit/Notice of Intent</td>
<td>Advised to submit NOI at least (10) days prior to July 1, 2010 to be covered under existing GCP and grandfathered under new Permit effective July 1, 2010. A SWPPP will be developed prior to the start of soil-disturbing activity and shall be implemented concurrently with commencement of soil-disturbing activities.</td>
</tr>
<tr>
<td>California Department of Fish and Game</td>
<td>Streambed Alteration Agreement/Notification</td>
<td>Submit a complete notification package and fee to appropriate CDFG regional office. If CDFG determines that the activity may substantially adversely affect fish and wildlife resources, a Lake or Streambed Alteration Agreement will be prepared.</td>
</tr>
<tr>
<td>Central Valley Water Quality Regional Control Board (CVRWQCB)</td>
<td>Chapter 15/ Title 27 - Waste Containment (Waste Piles and Mining Wastes)</td>
<td>Evaluate as necessary.</td>
</tr>
<tr>
<td>Colusa County - Public Works Department</td>
<td>Land Grading Permit</td>
<td>Will need to obtain permit for disturbance of 5 or more acres. Total grading and/or leveling estimated at over 5 acres.</td>
</tr>
<tr>
<td>Colusa County Air Pollution Control District</td>
<td>Authority of Construct</td>
<td>Check air district for dust suppression and other BMPs. BMPs may suffice in lieu of permit.</td>
</tr>
<tr>
<td>Colusa County - Planning and Building Department</td>
<td>Land Use Permit</td>
<td>Will verify requirements with County.</td>
</tr>
<tr>
<td>Colusa County - Public Works Department</td>
<td>Encroachment Permit Chapter 29</td>
<td>Will depend on whether project activity will encroach upon County roads. Need to determine if internal haul road rehabilitation work is on a County road, mapped as ’Sulphur Creek’ road.</td>
</tr>
<tr>
<td>Mine Area</td>
<td>Mining-Related Solids</td>
<td>Structures</td>
</tr>
<tr>
<td>--------------</td>
<td>---------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Central Mine | Group C material: Re-grade, cover and vegetate waste rock and east calcine pile, implement surface controls to prevent erosion of upper mine cuts, waste rock, tailings piles, haul roads. 
Group B material: Remove waste (west calcine pile) to an appropriate repository. | Based on further evaluation: Remove metal debris for disposal or recycling, if applicable; Demolition of and excavation of waste from around the perimeter of the furnace and furnace/retort, dispose off site at appropriate repository, and implement surface controls. |
| Cherry Hill Mine | Excavate waste rock and transport to Group B mine waste repository; implement surface controls to control erosion of disturbed surfaces; grate adits. | Removal of the former mill foundation not required; implement surface controls. |
| Empire Mine  | No Action                                                                             | No Action                                                                                      |
| Manzanita Mine | Group C material: Regrade, cover, and vegetate; implement surface controls to mitigate erosion of waste material to floodplain; grate shafts and adits. 
Ore: Excavate and transport to gold reclamation facility, or transport to appropriate disposal facility; implement surface controls to control erosion of disturbed surfaces. | None present                                                                                     |
| West End Mine | Excavate ore and transport to gold reclamation facility or appropriate disposal facility; implement surface controls to control erosion of disturbed surfaces. Grate shafts and adits. | None present                                                                                     |
| Wide Awake   | Excavate waste rock and tailings and transport to Group B mine waste repository. Remove metal debris for recycling, if required. Grate shafts and adits. | Excavate waste from around the perimeter of the processing facilities, haul and dispose off site, leave historic facilities and features intact, and implement surface controls. |
## Overview of the Vegetation Restoration Plan: Year 1
### Sulphur Creek Mining District
### Colusa County, California

### Areas of Interest
- Wide Awake Mine
- Central Mine
- West End Mine
- Cherry Hill Mine
- Manzanita Mine

### Program Objective
Introduce/seed herbaceous grasses/forbs to control soil erosion and promote future succession of plant communities.

<table>
<thead>
<tr>
<th>Substrate</th>
<th>Wide Awake Mine</th>
<th>Central Mine</th>
<th>West End Mine</th>
<th>Cherry Hill Mine</th>
<th>Manzanita Mine</th>
</tr>
</thead>
<tbody>
<tr>
<td>bedrock</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>topsoil</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Slope</th>
<th>Wide Awake Mine</th>
<th>Central Mine</th>
<th>West End Mine</th>
<th>Cherry Hill Mine</th>
<th>Manzanita Mine</th>
</tr>
</thead>
<tbody>
<tr>
<td>steep (≥ 5% grade)</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>flat (&lt; 5% grade)</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Seed Mix</th>
<th>Wide Awake Mine</th>
<th>Central Mine</th>
<th>West End Mine</th>
<th>Cherry Hill Mine</th>
<th>Manzanita Mine</th>
</tr>
</thead>
<tbody>
<tr>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Performance-Based Goal</th>
<th>Wide Awake Mine</th>
<th>Central Mine</th>
<th>West End Mine</th>
<th>Cherry Hill Mine</th>
<th>Manzanita Mine</th>
</tr>
</thead>
<tbody>
<tr>
<td>40% cover</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>40% cover</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
</tbody>
</table>

### Notes:
1. Restoration Habitat Types = desired future habitat types
2. Progress/achievement of Year 1 performance-based triggers may be qualified to account for factors observed in the field, such as unanticipated climate (e.g., precipitation), grazing pressure (e.g., wildlife, cattle), competing invasive plants, and/or disease.

### Legend:
- AG = Annual Grassland
- MC = Mixed Chaparral
- VFR = Valley Foothill Riparian
- VOW = Valley Oak Woodland
- W = Wetland

---

Page 1 of 1
Appendix A
Sulphur Creek Instability Photo Log –
Existing Conditions in the Main
Channel of Sulphur Creek
(source: Kenneth Myers, P.E.)
Active incision in the channel well upstream of the West End Mine

The incision gives way to aggradation, avulsion, and a poorly defined braided channel, still well upstream of the West End Mine
The poorly defined braided channel

Aggradation and the accumulation of fine sediment within the channel
An active headcut and a return to channel incision, still upstream of the West End Mine

Incision exposes a clay hardpan in the floor of the channel
Lateral migration and severe bank erosion, near the West End Mine

A relatively stable reach created by a limestone ledge forming grade control within the channel located about midway between the West End Mine and the Manzanita Mine
Immediately downstream of the limestone ledge, a return to incision and instability
Appendix B
Sulphur Creek District Background
Mercury Information
**APPENDIX B**

**BACKGROUND MERCURY DATA**

Grid Sampling Data Total Mercury  
By Atomic Adsorption  
(Homestake Report, R.W. Hatch, 1983)

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<th>Sample No.</th>
<th>Alteration</th>
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**Notes:**

- ppm = parts per million or milligrams pre kilogram
- ND = not detect
- solfaterized = Vapor phase alteration above the water table
Total Mercury Values
Altered vs Unaltered Rock

Samples Analyzed

Total Hg (ppm)

Altered Lithologies
Unaltered Lithologies
Appendix C
Sampling and Analysis Plan
APPENDIX C
Sampling and Analysis Plan for Mining-Related Materials

Prepared for:
Homestake Mining Company of California

Sulphur Creek Mining District
Central Group and Wide Awake Mines
Colusa County, California

April 2010

www.erm.com
APPENDIX C
Sampling and Analysis Plan for Mining-Related Materials
Sulphur Creek Mining District
Central Group and Wide Awake Mines
Colusa County, California

April 2010

Project No. 108205.04

John Kinsella
Partner-in-Charge

Laura Tesch
Project Director

A. Michael Arnold
Project Manager

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LIST OF ATTACHMENTS

ATTACHMENT A – QUALITY ASSURANCE PROJECT PLAN

LIST OF FIGURES (Figures immediately follow the text)

Figure 1 Site Location Map
Figure 2 Central Group and Wide Awake Mines Site Map
Figure 3 Mining Waste Classification Process
**LIST OF ACRONYMS**

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1.0 INTRODUCTION

In 2009, the Central Valley Region Water Quality Control Board (CVRWQCB) issued Draft Cleanup and Abatement Orders (CAOs) to Homestake Mining Company of California (Homestake) and others for past mining activities associated with the following mines within the Sulphur Creek Mining District:

- Central Mine Group,
  - Central Mine,
  - Cherry Hill Mine,
  - Empire Mine,
  - Manzanita Mine,
  - West End Mine; and
- Wide Awake Mine.

The status of the CAOs is pending; they are subject to change as negotiations continue. Homestake’s involvement in the Central Mine Group and Wide Awake Mine areas was limited to exploration activities from 1978 to 1992 in the vicinity of these mines. Under an agreement with the CVRWQCB, Homestake will mitigate mercury source contribution from former mine areas by removal of mining-related equipment, waste rock, and tailings.

ERM-West, Inc. (ERM) has prepared this Sampling and Analysis Plan (SAP) to describe the scope and methods for materials characterization activities that may be conducted during material removal and stabilization activities at the Central Mine Group and Wide Awake Mine (the “sites”). A Site Location Map is provided as Figure 1.

1.1 PROJECT OBJECTIVES

The primary objective of the field sampling effort is to characterize mining-related materials, including waste rock, tailings, and mining equipment located at the mine sites as necessary during remediation activities. This information will be used to determine appropriate disposal of these materials and to estimate the cost of disposal.
1.2  REPORT ORGANIZATION

This SAP is organized into five sections and two appendices as follows:

- Section 1.0 provides general introductory information;
- Section 2.0 provides background information on the mines;
- Section 3.0 describes the scope of work;
- Section 4.0 outlines the project schedule and deliverables; and
- Section 5.0 lists references.

Attachment A contains the Quality Assurance Project Plan. The Health and Safety Plan for sampling activities is included as part of the remediation work plan, of which this SAP is an appendix.
2.0 BACKGROUND

This section presents background information related to the planned material characterization activities. Information provided in this section includes mine locations and geologic settings, and historical activities at each mine.

2.1 SITE LOCATIONS AND FEATURES

The Sulphur Creek watershed is located within the eastern side of the Coast Range geomorphic province of California, about 8 miles west of the western margin of California’s central valley and approximately 24 miles west of Williams, California.

The Sulphur Creek watershed is located in the northern California Coast Range near the Coast Range Thrust Fault. The Coast Range Thrust pushed a thick sheet of mostly sedimentary rocks (the Great Valley Sequence) over the metamorphic rocks of the Franciscan Complex. Numerous faults underlie the Sulphur Creek watershed, including the Stony Creek Thrust and the Resort Fault Zone. Common lithologies in the area include detrital serpentines, sandstone, and mudstone.

Sulphur Creek is an intermittent stream with continuous flows between the fall and spring months (October through June). Stretches of the stream are wet throughout the year because of inputs from geothermal springs (CVRWQCB 2007).

2.2 LAND USE AND DEVELOPMENT

2.2.1 Current Surrounding Land Use

Land use within the Sulphur Creek watershed is predominantly rangeland consisting of undeveloped chaparral and California scrub oak. Part of the Sulphur Creek watershed is privately owned and cattle graze on some private property in the lower watershed. The U.S. Bureau of Land Management administers public land in the upper portion of the watershed. The Wilbur Hot Springs resort is located on Sulphur Creek about 1 mile upstream of the confluence with Bear Creek. There are no year-round residences in the watershed, except those associated with the
Wilbur Hot Springs resort (CVRWQCB 2007). The nearest community to the District is the town of Williams about 24 miles to the east.

2.2.2 Mining Development and History

This subsection describes the historical activity at the mines within the site area (Figure 2). An expanded description of the site is available in the Preliminary Conceptual Site Model for Sulphur Creek Mining District (ERM 2009).

Wide Awake Mine: Other names for the Wide Awake Mine are Wide Awake Consolidated, Buckeye, Buckeye Quicksilver Mine, and Jefferson Mine. Originally known as the Buckeye Mine, it began operations in the 1870s, and was worked extensively for several years, with an output of 1,800 flasks of mercury. The initial production was from shallow surface workings and tunnels. Later, 500-foot vertical shafts were sunk, with levels at 190, 290, and 390 feet. In the late 1890s, a small production began with the operations ending in about 1901. Some work was done in 1932 and 1943 with a moderate production. Total production from the mine was about 1,800 flasks, most of which was produced in the 1870s. Processing facilities included large rotary furnaces and retorts.

Central and Empire Mines: The Central and Empire mine area was part of the Central group, included several mines: Central, Empire, Little Giant, Mercury Queen, Mercury King, Hidden Treasure and the Sulfur Creek Mine. The Empire Mine was located in the 1870s and the Central in 1891. In 1873 the Empire Mine produced 63 flasks of mercury. No significant production occurred from the Central Mine until 1926 when about 107 flasks were produced. The mines were idle until 1942 when a small production was reported. Total production from the Central and Empire Mines was approximately 170 flasks.

Mine workings included several hundred feet of tunnels. In 1873, ore from the Empire Mine was processing in the nearby Buckeye Mine (later called the Wide Awake Mine) in a small retort. During the 1890s, ore from the Central and Empire group was likely processed at the Abbot facilities. In 1926 a small furnace was installed on the Central Mine, but was unsuccessful so ore was processed via pipe retorts.

Manzanita Mine, Cherry Hill, and West End Mine Areas: This part of the Central Group included the Manzanita, West End, North Star, Monticello, Oak Tree, Cerise, and Cherry Hill Mines, and the Hughes mill site. The Manzanita Mine was initially operated for both gold and mercury, beginning in about 1863 until 1891. The Cherry Hill and West
End were also gold mines. The Manzanita area mines produced mercury from 1902 to 1942, yielding over 2,500 flasks. The mine workings included numerous tunnels and shafts, most of which are caved-in and inaccessible. Much work was also done by glory hole and open cut mining methods.

The Manzanita Mine was initially opened as a quicksilver mine, subsequently worked entirely for gold, and in later years worked for both gold and quicksilver. Processing was performed for gold, gold and mercury, and mercury alone, with ores concentrated by mechanical means prior to recovery. Ore was typically pulverized in a stamp mill, sized by gravity, and then passed over sluices to concentrate. The dried concentrates were mixed with lime and then retorted.
3.0 SCOPE OF WORK

This section describes the approach and methods for collection and analysis of waste characterization samples.

Data quality objectives (DQO) were developed for this investigation. DQOs are qualitative and quantitative statements developed through the seven-step DQO process that clarify study objectives, define the appropriate types of data, and specify tolerable levels of potential decision errors that will be used as the basis for establishing the quality and quantity of data needed to support decisions (EPA 2000a, 2000b). DQOs are used to develop a scientific and resource-effective design for data collection. Specific DQOs for the sampling and analysis program are summarized in the Quality Assurance Project Plan (QAPP) in Attachment A.

3.1 APPROACH TO WASTE CLASSIFICATION

The material characterization approach is intended to determine appropriate waste designations, and therefore disposal options, for mining-related materials at the sites in accordance with Resource Conservation and Recovery Act (RCRA) and State of California regulations.

RCRA has been modified to allow exceptions to waste designation requirements for mining-related wastes. RCRA was amended in 1980 by the Bevill Exclusion, to exclude "solid waste from the extraction, beneficiation, and processing of ores and minerals" from regulation as hazardous waste under Subtitle C of RCRA. The State of California waste regulations acknowledge the Federal exclusion, but include the following waste classification related to mining solid waste:

- **Group A** – Mining-related waste determined to be a significant threat to groundwater quality that the CVRWQCB determines must be managed as hazardous waste.
- **Group B** – Mining-related waste that consist of or contain materials that pose a significant risk to water quality that qualify for a variance, provided that the CVRWQCB finds that such mining wastes pose a low risk to water quality.
- **Group C** – Mining-related waste from which any discharge would be in compliance with the applicable water quality control plan, include water quality objectives other than turbidity.
A waste designation process and disposal flow chart for mining wastes in California is included in Figure 3.

3.2 PREVIOUS WASTE CHARACTERIZATION SAMPLING

Materials characterization sampling was conducted at the sites to date is summarized in the remediation work plan, of which this SAP is an appendix.

Based on the general knowledge of the geologic formation and the specific materials characterization test results to date, the additional waste characterization sampling is anticipated to focus solely on mercury.

3.3 MATERIALS CHARACTERIZATION SAMPLING

3.3.1 Structure and Equipment Sampling

Structure and equipment materials located at the SCMD mines include metal pipes, metal retorts, ceramic materials, and brick furnaces. Metal equipment will not be sampled, but will be visually inspected for the presence of elemental mercury during removal activities. Ceramic, brick, and concrete materials will be sampled for waste characterization purposes, as these materials may have absorbed mercury during ore processing. Procedures for each material are provided below.

At each former structure of ceramic, brick, or concrete, at least two samples will be collected from each structure. One sample will be collected from an area with visual signs of use for mining-related activities, such as dark staining or an area that mercury would have commonly contacted, such as the inside of a furnace. The second sample will be collected from an area showing little to no visual indications of use.

Ceramic, brick, and concrete samples will be collected by field personnel using the following procedures:

1. Wear clean, nitrile gloves while conducting all sampling activities.
2. If possible, select ceramic, brick, and concrete from loose piles. To prevent injury, avoid collection of samples from standing structures if possible. Mechanically remove soil and dust from the outside of the sample using a decontaminated nylon brush.
3. Remove complete and/or broken fragments of ceramic, brick, and concrete materials, as available to remove in a safe manner. Collect
enough sample volume to meet laboratory requirements for each analytical method (described below).

4. Place samples in clean, laboratory-provided glass jars or other laboratory-approved containers and label using indelible ink and then place the samples in a cooler with ice.

5. Record date, time, and location where sample was collected.

Each sample will be analyzed for total and leachable mercury. Laboratory methods are described further in Section 3.3.

3.3.2 Waste Rock and Tailings Samples

General Approach

Waste rock and tailings from each mine site will be sampled for purposes of waste characterization. Mining waste will be identified in the field based on visual observations, including color and grain size distribution of material, vegetation type, and vegetation density. The number of samples collected, and the type of sample (discrete or composite) will be determined in the field based on the type and volume of material to be sampled.

Sample Collection/Composite Methods

Waste rock and tailings samples will be collected from each location using decontaminated hand tools.

Prior to collecting the sample at each sample location, a minimum of 3 to 6 inches of the topmost material will be moved aside to expose unweathered waste material. Samples will be handled and transported under chain-of-custody procedures. Composite samples will be prepared in the laboratory using equal aliquots of the designated discrete samples.

3.4 QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

Quality Assurance/Quality Control (QA/QC) samples will include the following:

- At least one duplicate sample will be collected for every 20 primary samples;
- A project-specific matrix spike/matrix spike duplicate will be collected for every 20 waste rock/mine tailings samples;
• One rinsate blank will be collected from tools used for collecting waste rock/tailings samples for each 20 primary samples collected; and

• Any additional QA/QC samples recommended by the laboratory for specific analyses.

3.5  ANALYTICAL METHODS

This subsection describes the analytical methods to be performed on each sample. All analyses will be performed by a California-certified environmental laboratory.

3.5.1  Equipment and Building Material Samples

Ceramic, brick, and concrete samples will be analyzed for one or both of total mercury by United States Environmental Protection Agency (USEPA) Method 7471A and STLC mercury using the CalWET Method.

3.5.2  Waste Rock and Tailings Samples

Composite samples collected from waste rock and tailings deposits will be analyzed for one or both of total mercury by USEPA Method 7471A and STLC mercury using the CalWET Method.

3.6  DECONTAMINATION PROCEDURES

All non-dedicated sampling equipment will be decontaminated prior to use and between sample collection points. Standard decontamination procedures call for scrubbing sampling equipment with a laboratory-grade detergent (such as LiquiNox or Alconox), followed by a rinse with potable water and a rinse by ASTM Type II reagent water. After completing the decontamination process, the equipment will be positioned to preclude inadvertent contamination prior to reuse.

All decontamination fluids will be placed in a waste container that meets Department of Transportation specifications for removal to a waste collection facility.
4.0 SCHEDULE

Sampling will be completed as necessary to characterize materials as part of the remediation effort scheduled to be completed from July 2010 through October 2011.
5.0 REFERENCES

*Sulphur Creek TMDL for Mercury - Final Staff Report*. Sacramento, CA.


ERM. 2009. *DRAFT Preliminary Conceptual Site Model for Sulphur Creek Mining District Sulphur Creek Mining District, Colusa County, CA.*


Figures
Figure 3: Mining Waste Classification Process
Sulphur Creek Mining District
Colusa County, CA

Waste Type – As determined through Sample Analysis

Is there more than 2ppm gold content in material?

Yes

Does waste meet Group A Mining Waste Classification?

Yes

Group A Mining Waste
27 CCR §22480(b)(1)
- Mining waste will be managed in accordance with Title 27 regulations

No

Does waste meet Group B Mining Waste Classification?

Yes

Group B Mining Waste
27 CCR §22480(b)(2)
- Consist of or contain hazardous wastes, that quality for a variance under Chapter 11 of Division 4.5 of Title 22 of this code
- Provided that the CVWQCB finds that such mining wastes pose a low risk to water quality
- Consist of or contain nonhazardous soluble pollutants of concentrations which exceed water quality objectives for, or could cause, degradation of waters of the state
  - Determined by comparing sample data to the STLC and TTLC regulatory limits
  - If samples are above regulatory limits then waste will be classified under Group B

No

Does waste meet Group C Mining Waste Classification?

Yes

Group C Mining Waste
27 CCR §22480(b)(3)
- Wastes from which any discharge would be in compliance with the applicable water quality control plan including water quality objectives other than turbidity
  - If sample results are below STLC and TTLC regulatory limits, then waste is classified as Group C

No

Classification

Disposal

Take to Facility in Nevada for Reprocessing

See Class D

Waste Management – Altamont Facility (Class II Designated Facility)

OR

McLaughlin Mine – Lake County, CA

Construct Class C Unit on-site:
No Liner Requirements

OR

McLaughlin Mine – Lake County, CA

Footnotes: STLC = Soluble Threshold Limit Concentration & TTLC = Total Threshold Limit Concentration (CCR Chapter 11, Article 3)
Attachment A
Quality Assurance Project Plan
ATTACHMENT A
Quality Assurance Project Plan for Mine-Related Materials Sampling

Sulphur Creek Mining District
Central Group and Wide Awake Mines
Colusa County, California

Prepared for:
Homestake Mining Company of California

April 2010

www.erm.com
ATTACHMENT A
Quality Assurance Project Plan for
Mine-Related Materials Sampling
Sulphur Creek Mining District
Central Group and Wide Awake Mines
Colusa County, California

April 2010

Project No. 108205.04

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Attachment 1  TestAmerica Inc. Laboratory Quality Assurance Manual
(available on CD by request)

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1.0 INTRODUCTION

Homestake Mining Company of California (Homestake), as well as numerous other Potential Responsible Parties, was issued Draft Cleanup and Abatement Orders (CAOs) for past mining activities associated with the central portion of the Sulphur Creek Mining District (Central District). The status of these orders is pending, and subject to change as negotiations continue for an alternative regulatory approach to site remediation. Under an agreement with the Central Valley Region Water Quality Control Board (CVRWQCB), Homestake will remediate mine workings within the Central District by removal of mining-related equipment, waste rock, and tailings. Homestake involvement in the Central District was limited to exploration activities from 1978 to 1992 in the central portion of the district.

This Quality Assurance Project Plan (QAPP) presents the quality assurance (QA) and quality control (QC) objectives, organization, and functional activities associated with the sampling and analyses of samples obtained during the mining-related waste characterization. This QAPP is prepared in general accordance with the guidelines for preparing QAPPs as provided by the United States Environmental Protection Agency (USEPA 2002).

The objective of the mine waste characterization field investigation is to provide data that characterizes the mine waste for selection of appropriate disposal options. A detailed discussion of the purpose and objectives of the sampling are described in the associated Mining-Related Waste Characterization Sampling and Analysis Plan (SAP).

Types of data to be collected under the SAP include characteristics of mine-related materials (waste rock, tailings, brick, ceramic, and concrete) to include total mercury by United States Environmental Protection Agency Method Method 7471A and Soluble Threshold Limit Concentration (STLC) mercury by the California Waste Extraction Test (CalWET) Method.

1.1 PROJECT ORGANIZATION

As part of this project, ERM-West, Inc. (ERM) will perform the sample collection, data analysis, and reporting under contract with Homestake. TestAmerica in Pleasanton, California is performing the laboratory
analysis of the samples under subcontract to ERM. TestAmerica is a California-certified environmental laboratory.

The key project team members, roles and contact information are provided below.

<table>
<thead>
<tr>
<th>Company</th>
<th>Name</th>
<th>Project Role</th>
<th>Phone</th>
<th>Email</th>
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</tr>
</tbody>
</table>

1.2 TASKS DESCRIPTION

The tasks to be completed for this project include field work, laboratory analysis, data quality evaluation, data management, data analysis, and reporting.

The tasks to be completed in the field are detailed in the SAP, which includes procedures for:

- Field activity documentation;
- Sampling equipment;
- Sample collection and handling;
• Sample identification and chain-of-custody; and
• Equipment decontamination.

A summary of samples, analyses to be performed by the laboratory, the analytical methods that will be used, and the laboratory-provided analytical method control limits is presented in Table 1. Sample locations and analyses to be performed at each of the former mine areas are described in the SAP. Table 2 summarizes the sample and laboratory analyses for water quality control samples and Table 3 details the sample container, preservation and holding times.

The laboratory will report the results in hardcopy and as an electronic data deliverable in a format suitable for importing into a project database. ERM will perform the data validation and data quality assessment.
2.0 DATA QUALITY OBJECTIVES

The purpose of this QAPP is to describe the requirements and/or criteria necessary to produce data of sufficient technical quality to support the mine-related waste characterization for the Central District. This is achieved through the assessment of data quality measures, including precision, accuracy (bias), representativeness, completeness, comparability, and data reporting limits against the quality control criteria.

Data Quality Objectives (DQOs) are qualitative and/or quantitative statements to ensure that data of known and appropriate quality are collected to support specific decisions or answer specific regulatory requirements. The DQOs describe what data are needed, why the data are needed, and how the data will be used to address the problem being investigated. DQOs also establish numeric limits for the data to allow the data user (or reviewers) to determine whether data collected are of sufficient quality for their intended use.

The project DQOs for the project relate to the characterization of mining-related wastes. Specific DQOs include:

• Characterization of waste rock and tailings chemistry / physical properties to determine mercury concentrations for disposal; and

• Characterization of former mine-related equipment to determine the mercury concentration for disposal.

2.1 DATA QUALITY CONTROL

Data generated during the project will provide the basis for completing a removal action at the sites. To support this use, and to fulfill project objectives, usable data are required.

The usability of the data collected during this project depends on its quality established through a QC review. Multiple factors relate to the quality of data, including sample collection methods and analytical methods. Following standard operating procedures (SOPs) for both sample collection and analysis will reduce sampling and analytical error. Complete chain-of-custody documentation, adherence to required sample preservation techniques, holding times, and proper shipment methods ensure sample integrity.
Quantification limit objectives are based on the extent to which the laboratory or field equipment, or analytical process, can provide accurate data measurements of reliable quality for specific constituents in field samples. The actual quantification limit for a given analysis will vary depending on instrument sensitivity and matrix effects.

2.2 DATA QUALITY INDICATORS AND METHOD QUALITY OBJECTIVES

The data quality indicators presented in this section are: precision, accuracy, representativeness, comparability, completeness, and sensitivity. Data quality indicators can be applied to both field and laboratory analytical measurements to ensure that data of known and appropriate quality are obtained to support specific decisions or regulatory actions.

Method quality objectives are project specific requirements for the data quality indicators. The method quality objectives are selected to support any statistical requirements of the analytical data. Standard laboratory control limits will be used to evaluate data quality indicators for analytical data. Laboratory control limits for the method quality objective criteria are presented in Tables 1 and 2, and definitions and discussion of the data quality indicators follow below.

**Precision.** Precision is defined as the degree of agreement between or among independent, similar, or repeated measures. Precision is expressed in terms of analytical variability and will be calculated intra-laboratory. For this project, analytical variability will be measured as the relative percent difference (RPD) or coefficient of variation between analytical replicates/duplicates (i.e., field or laboratory) and between the matrix spike (MS) and matrix spike duplicate (MSD) analytical results. Short-term precision will be measured since the duplicates will be analyzed at the same time the primary samples are analyzed.

Precision will be calculated as the RPD of analytes as follows:

\[
\% \text{ RPD} = \frac{|O - D|}{\left(\frac{O + D}{2}\right)} \times 100
\]

where:

\[
\% \text{ RPD} = \text{Relative percent difference}
\]
The resultant RPD will be compared to acceptance criteria and deviations from specified limits reported. If the acceptance criteria are not met, the laboratory or laboratories will supply a justification of why the acceptability limits were exceeded and implement the appropriate corrective actions.

**Accuracy.** Accuracy is the amount of agreement between a measured value and the true value. It will be measured as the percent recovery (%R) of the MS/MSD and laboratory control samples. It also will be measured using the analytical results of instrument calibration and other laboratory internal standards.

Accuracy will be calculated as the percent recovery (%R) of analytes as follows:

\[
% \ R = \frac{SS - S}{SA} \times 100
\]

where:

- \( % \ R \) = percent recovery
- \( SS \) = measured analyte concentration in spiked sample
- \( S \) = measured concentration in unspiked (native) sample
- \( SA \) = concentration of spike added

The resultant percent recoveries will be compared to acceptance criteria and deviations from specified limits will be reported. If the objective criteria are not met, the laboratory will supply a justification of why the acceptability limits were exceeded and implement the appropriate corrective actions.

**Representativeness.** Representativeness is the degree to which data accurately and precisely represent a parameter variation at a sampling point or an environmental condition. The results of all analyses will be used to evaluate the data to determine if the samples were collected in a manner such that the results appropriately describe the area investigated.
**Comparability.** Comparability is the degree to which data from one study can be compared with data from other similar studies, reference values (such as background), reference materials, and screening values. This goal will be achieved by: 1) using standard techniques to collect and analyze representative samples and by reporting analytical results in appropriate units; and 2) comparing current results with previous results, where possible.

**Completeness.** Measurement of completeness (C) can be defined as the ratio of acceptable (non-rejected) measurements obtained to the total number of measurements for an activity expressed as a percent. Percent completeness can be defined as:

\[
% \ C = \frac{\text{Number of acceptable data points}}{\text{Total number of data points}} \times 100
\]

**Sensitivity.** As used in this context, sensitivity refers to the ability of project analytical procedures to identify and quantify target analytes at concentrations low enough to meet project data needs. Specific indicators of sensitivity in analytical measurements include the method detection limit (MDL), method reporting limit (MRL), and the sample-reporting limit (SRL).

The MDL is a purely statistical value, which is defined by the USEPA as the concentration at which an analytical system has a 99 percent probability of avoiding false positive results, and is determined by preparation and analysis of a minimum of seven replicate portions of a low level standard. The MDL lies in a region of high quantitative uncertainty, and results near the MDL must be considered as estimates.

The MRL is normally set at a factor of 5 to 10 times the MDL. The exact number depends on the lowest concentration that a laboratory can successfully use as a low calibration standard. The MRL is considered the lowest concentration that a lab can report with reasonable quantitative accuracy, although results less than 5 times the MRL can still be highly variable.

The sensitivity of the analytical methods (i.e., MRLs) identified for this project are sufficient to allow comparison of project results to the values used to determine disposal options. Analytical MRLs for all analytes are listed in Table 2. The SRL represents the lowest concentration of an analyte that can be reported with reasonable quantitative accuracy in a particular sample. The SRL is typically represented as the MRL multiplied by a dilution factor. Complicating factors such as limited
sample volume, matrix effects and high concentrations of target and non-target analytes may necessitate sample dilutions and consequently elevating the SRL above the MRL. It is possible that the high concentrations of mercury in samples collected from waste rock and tailings piles may require dilution.

2.3 DOCUMENTS AND RECORDS

Records will be maintained to document the activities and data related to the field sampling, laboratory analysis, and the results of the data verification and validation. These records will be archived in the ERM project file and the administrative record for the project. Following data validation, the sampling results will also be uploaded to the project database.

2.3.1 Field Documentation

Field logbooks will be the main source of field documentation for all field activities. Notes will be taken in indelible, blue or black ink. The front and inside of each field logbook will be marked with the project name, number, and logbook number. The field logbooks or copies of the field notes will be stored in the project files when not in use and upon completion of the sampling event.

The first entry at the beginning of each day will state the date and time, project number, names of all field personnel on-Site (including subcontractors and the company for which they work), weather conditions, and the purpose of fieldwork. Each subsequent page will be started with the project number and the date. The bottom of each page will have the date and the initials of all personnel entering information onto that page. Any remaining unused lines will be crossed through. Errors will not be erased. All errors will have a single strikethrough with an initial and date next to the strikethrough and the subsequent change made. At the end of each day the field staff note taker will sign the field logbook.

Information specific to each mine will be recorded during sampling in the dedicated field logbook. Information recorded in the logbook may include, but will not be limited to:

- Mine identification;
- Weather conditions;
• Surrounding site activities;
• Date and time of sampling for each field sample and QA/QC sample;
• Sample identification or naming system, including each unique sample name/number;
• Sample location information and sample description;
• Volume of sample collected by number and type of sample containers;
• Sample preservation techniques and analyses requested; and
• Information relevant to quality control (e.g., sampling discrepancies or difficulties, unexpected conditions, abnormal sampling procedures).

Once the sample has been collected, the sample will be entered onto the chain of custody (COC) forms. These forms are used to document the custody of the samples from the field until receipt at the laboratory. Upon receipt at the laboratory the samples will be checked for physical integrity and logged into the laboratory sample tracking system. The COC forms and the sample receipt forms will be included in the laboratory data report package. Any discrepancies in the physical conditions of the samples or breaks in the chain of custody will be reported to the ERM Laboratory Coordinator within 24 hours of sample receipt.

2.3.2 Sampling Number System

The sample numbers will be designated in the field based on the location and type of material being sampled.

2.3.3 Laboratory Documentation

It is anticipated that full validation of raw data will be not be required for samples collected in support of this project, as these represent typical analyses that have been performed previously for samples collected at the Central Mine Group and Wide Awake Mine (Tetra Tech EM, Inc. 2003). Laboratory documentation and data deliverables for samples will therefore not include raw data, but will be provided as summary data packages including sufficient detail to assess data quality. Specific documentation to be included in the laboratory summary data packages includes:

• A case narrative that describes any problems encountered by the lab during analysis of project samples and results limitations in data usability;
• A cross-reference between laboratory sample IDs and project sample names;

• Summaries of analytical results for project samples, including method detection limits, method reporting limits or sample quantification limits, preparation and analytical method used, identification of any dilution performed, and footnotes to indicate any data usability limitations;

• Summaries of quality control results associated with the project samples including laboratory blank results, blank and matrix spike recoveries, duplicate analysis results, and surrogate recoveries where applicable; and

• Copies of the COC forms and laboratory sample receipt forms.

Though not included with the summary data packages, raw data will be maintained and archived by the laboratories and will be made available upon request.

2.3.4 Quality Documentation

Data verification and validation will be performed as a summary data quality review or a full data validation as described in Section 5 of this QAPP. Data Quality Review Reports will be prepared by ERM and submitted to the Task Manager and Project Director.
3.0  DATA ACQUISITION

The SAP describes the rationale and approach that will be used to collect data to support the mine-related waste characterization for the Central District.

3.1  SAMPLING PROCESS DESIGN

Sampling will be performed at the mines included in the Central Mine Group (Central, Manzanita, West End, and Cherry Hill mines) and the Wide Awake Mine. The number and types of samples to be collected varies according to total volume of material to be removed at each former mine area, as well as known characteristics of the material at each mine site. The rationale for specific sampling locations and types of samples to be collected at each former mine area is described in the SAP.

3.1.1  Sampling Objectives

The objective of the sampling is to collect a sufficient number of samples from each mine area to supplement existing data and provide results of adequate quality to characterize the mine-related waste for disposal.

Waste rock, tailings, and building/equipment material samples will be analyzed for one or both of the following:

- Total mercury; and
- STLC (Cal-Wet) mercury.

3.1.2  Sampling Methods and Handling

The methods used to waste rock, tailings, and building/equipment material samples are detailed in the SAP. USEPA Method 1669 will be modified for collecting the waste rock, tailings, and building/equipment material samples. The equipment and techniques used depend on the type of sample being collected and the sampling location. SOPs are explained in the SAP.

The analytical sample container requirements, preservation, and holding times are summarized in Table 3. The sample jars used for samples will be laboratory-provided, pre-cleaned jars with Teflon-lined screw type lids. Equipment blank (water) samples will be collected into laboratory-
provided bottles with appropriate preservative. The laboratory will maintain shipping and certification records from the supplier to trace the bottles back to the respective bottle rinse blank results.

### 3.2 ANALYTICAL METHOD REQUIREMENTS

Analytical methods used will be appropriate for the intended use of the data as described in this QAPP. Where possible, analytical methods will include USEPA-approved methods (USEPA 1994, USEPA 2007). For analyses for which USEPA-approved are not available, standardized methods have been identified (Plumb 1981, APHA 1998). Adherence to the relevant preparation and extraction, analytical and reporting methods will be evaluated during the data review. The analytical methods for individual analytes are summarized in Tables 1 and 2 for waste rock, tailings, building/equipment materials, and water analyses.

### 3.3 QUALITY CONTROL

QC samples will be prepared in the field and in the laboratory to assess the bias and precision of the field and laboratory methods.

#### 3.3.1 Field Quality Control

Field QC samples will consist of field duplicate samples and equipment rinsate blanks. Field duplicates will be collected at a frequency of 5 percent of the total number of samples for the matrix (1 per 20 field samples), with a minimum of one field duplicate per sample type. If non-dedicated sampling equipment is used, equipment blanks will be collected at a frequency of one per day for sampling methods using non-dedicated equipment.

Field duplicates are replicate samples collected at the same location during the same sampling session and at the same time. Field duplicate samples are submitted to the contract laboratory and provide an indication of the reproducibility (accuracy) of the sampling and analysis procedures for a given sample matrix, including heterogeneity of the sample itself. The field duplicates will be collected in the same container types and handled and analyzed in the same manner as primary samples. Field duplicate samples will be collected for waste rock, tailings and building/equipment material sample matrices.
Equipment rinsate blanks are samples designed to assess the potential for cross-contamination after equipment decontamination. These samples are collected from the final de-ionized water rinse, following equipment decontamination. Equipment blank samples are collected directly into water sample containers. The sampling protocols and equipment have been designed to minimize the potential for cross-contamination and to limit the amount of equipment decontamination required in the field.

Equipment blanks for waste rock and tailings sampling equipment will be collected from shovels, mixing bowls, and other non-dedicated equipment which contacts the samples. Waste rock and tailings sampling equipment blanks will be analyzed for total mercury.

3.3.2 **Laboratory Quality Control**

The detailed requirements for the laboratory QC procedures are given in the USEPA method protocols that have been referenced and the laboratories’ standard operating procedures and QA manuals. These requirements also include control limits and corrective actions. The laboratory will adhere to the QC procedures in the method protocols and this QAPP. Laboratory QC samples will include method blanks, matrix spike/matrix spike duplicates, and duplicates, as appropriate for the analytical method. The frequency of laboratory QC samples will be one every twenty samples, with a minimum of one per extraction batch.

The control limits, or method quality objectives, for the applicable recoveries and relative percent differences are given in Tables 2 and 3. These performance-based control limits have been established by the laboratory as required by the applicable methods and these criteria will be used by the laboratory to determine the acceptability of the data.

3.4 **EQUIPMENT CALIBRATION PROCEDURES**

Field measurements during the sampling event may be collected using a global positioning system (GPS) unit. If possible, each sample location will be recorded using a GPS unit for accuracy in mapping. ERM will follow the manufacturer’s specific instructions for the calibration, operation, and maintenance of the GPS unit.

Analytical laboratory instruments and measurement equipment will be calibrated in accordance with manufacturer’s instructions and the analytical laboratories’ quality assurance manual (QAM). Records of
standard preparation and instrument calibration data shall be maintained by the laboratory.

3.5 **INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES**

The quality of the supplies and consumables used during sample collection and analysis can affect the quality of the data. Non-dedicated sampling equipment will be decontaminated prior to use to help ensure that no detectable contamination is introduced to the samples.

The laboratory will provide cleaned and documented sample containers for waste rock, tailings, building/equipment material, and water sample collection. The containers will be visually inspection prior to use. Any suspect containers will be discarded.

Reagents used in equipment decontamination will have documented purity, and the containers will be initialed and dated when opened. Laboratory-provided de-ionized water, with documented quality, should be used for collecting equipment blanks and the final rinse during equipment decontamination. If de-ionized water that is not sourced from the laboratory is used, a de-ionized water blank sample will be required for analysis.

Reagents and calibration standards of appropriate purity, and suitably cleaned equipment will be used during the laboratory analysis. The acceptance criteria for the laboratory supplies and equipment are detailed in the laboratory SOPs and QAM. The documentation and certifications for field supplies and equipment will be retained by ERM, whereas the documentation and certifications for laboratory supplies and equipment will be retained by the laboratory.

3.6 **DATA MANAGEMENT**

Data for this project will be generated in the field and the laboratory, then reviewed for acceptability, and entered in the project database.

3.6.1 **Field Data**

Data generated in the field will include field log book entries, sample dates, field parameter measurements, observations, and additional information (such as field duplicate number). These data will be
manually entered into an electronic format, and then checked by a second person, before final inclusion in the database.

3.6.2 Laboratory Data

Data generated by the subcontract laboratories will undergo data reduction and review procedures described in the laboratory QAM and SOPs. Data generated, reduced, and reviewed by the laboratories will undergo a comprehensive data review under the direction of the laboratory QA Officer or designee.

Upon acceptance of the data by the laboratory QA Officer, or designee, deliverables will be generated and submitted to the ERM Project Director. Each data report package submitted to the ERM Project Director will contain the laboratory’s written certification that the requested analytical method was run and that all laboratory QC checks were performed.

Along with a hardcopy of the results, the laboratory data (including QC sample results) will also be reported as an electronic data deliverable (EDD) suitable for import to the project database.
4.0 ASSESSMENT AND OVERSIGHT

ERM will be responsible for the monitoring of field and sampling activities to maintain an appropriate level of sample QA. This project has a limited scope and only involves a small number of project team members. The ERM Project Director and Field Task Manager will stay in close communication with the field sampling team and the laboratory.

4.1 ASSESSMENTS AND RESPONSE ACTIONS

It is the responsibility of every team member to report non-conformances to the ERM Project Director, ERM Field Task Manager, or the laboratory Project Manager, as applicable. The ERM Project Director will ensure that the non-conforming data are not used until the non-conformance is corrected.

The planned assessment activities that ERM will perform include readiness reviews prior to sampling and prior to the release of final results to data users. Internal reviews will be on-going throughout the implementation of the project. No reports will be generated from the readiness reviews.

Pre-sampling preparation includes organizational and procedural planning before the actual sampling takes place. Each team member will understand their specific role and the roles of the other team members so that the sampling event reflects a coordinated effort. Each team member will understand the proper equipment and procedures to be used, the schedule of sampling events, the sequence of activities during any given event, and the health and safety procedures for the project. The Field Work Task Lead will verify that all field equipment is ready to be used at the site, that appropriate subcontractors have been contracted, scheduled and briefed (including a project specific health and safety briefing). Any deficiencies noted during this review will be corrected prior to commencing field work.

A second readiness review will be conducted prior to the release of final data to the users. The Laboratory Coordinator will verify that all analytical data have been received from the laboratory, that data validation and quality assessment have been completed, and appropriate data qualifiers have been entered into the database. Deficiencies found during this review will be corrected by the data manager or Project
Review of work products will be conducted through this project to ensure that all phases of work follow the QA procedures in this QAPP. Issues that arise during the project can usually be resolved between the reviewer and the person generating the work product. Any problems that cannot be easily resolved will be brought to the attention of the ERM Project and Field Task Managers. The ERM Project Director will notify the Homestake Project Coordinator upon identification of any QA problems that may affect the data’s use for meeting project objectives.

The laboratory has implemented an internal review system that formalizes the assessment and reporting of laboratory activities and QA procedures. Each phase of work is reviewed by a supervisor before it is released. The details of the laboratory review system are described in the QAM.

If serious problems are encountered during the sampling and analysis, a technical system audit may be required. The audit would be conducted by the ERM QA Manager or the laboratory QA manager. The audits may examine any phase of the field sampling, laboratory, or data management activities related to the project. The results of audits will be included in the laboratory data summary report.

4.2 REPORTS TO MANAGEMENT

All communications with Homestake’s Project Coordinator will be through the ERM Project or Task Manager.

Deviations from methods or QA requirements described in this QAPP and the related SAP will be corrected immediately if possible. The ERM Project Director will be notified, and assist in the resolving the issue if needed. It is not anticipated that a formal corrective action plan will be required. However, non-conformances that affect the quality of the data, or result in a change in scope, will be noted in the field logbook. This documentation will serve as the Corrective Action Report. The data summary report will include a description of the non-conforming issue, any attempted resolutions, and any effect on the quality and usability of the data.

Non-conformances discovered in the laboratory will be reported and resolved through the procedures detailed in the laboratory QAM and the
appropriate method protocols. Laboratory non-conformances and the
effects on data quality will be described in the data summary report.
5.0 DATA VALIDATION AND USABILITY

The field and laboratory data will be verified and validated according to the procedures and criteria described in this section. Data review and assessment for this project will follow guidance from USEPA and will be conducted under the supervision of the ERM Chemist. The quality and usability of the data will be evaluated and discussed in the data summary report.

5.1 DATA REVIEW, VERIFICATION, AND VALIDATION REQUIREMENTS

The field and laboratory data generated during this project will be verified and validated. Errors that are found during verification of the field data, laboratory data, and database entries will be corrected prior to the distribution of the final data.

The ERM QA Manager will review data reports and field data before data are used in an application or incorporated into a technical report. All analytical data will be reviewed by the laboratory and by the ERM Chemist to ensure that data are technically valid, defensible, and in general compliance with DQOs. Sample matrix effects will be evaluated and data will be appropriately identified, qualified, or disregarded. Qualified data will be so noted in the database and these data, as appropriate, may be excluded from certain project applications.

All tabular and graphical data representations will be reviewed to ensure that information is accurately portrayed. The ERM Project Director will review all deliverable work products to ensure that all findings and conclusions are based upon correct and accurate data. All reports will be prepared to ensure compliance with stipulated regulatory requirements and agency expectations. In situations that require review and evaluation of historic data, the limitations of reliance and the objectives of incorporation in the presentation will be clearly stated.

5.2 VERIFICATION AND VALIDATION METHODS

Field data will be verified during sample preparation and COC documentation, as well as at the completion of the field effort. The field data entries in the database will also be verified, and any errors corrected.
Data provided by the analytical laboratories will be reviewed and approved by the laboratories as described in Section 3.6.2 of this QAPP. Explanations of results outside of control limits and corrective actions taken by the laboratory will be described in the case narrative. The laboratory performs a data completeness check and verification as part of the preparation of the EDD. Data entries (including qualifier entries) in the database will be verified against hardcopies. Any errors will be corrected before final release of the data.

Laboratory data verification and validation for waste rock, tailings, building/equipment material, and water analyses will be completed as a summary data quality review to be performed in general accordance with the USEPA functional guidelines for data review (USEPA 2004) and the applicable analytical methods. The summary data quality review will include reviewing the laboratory documentation, results of quality control samples, assessment of data completeness, comparison to the data quality objectives, and an assessment of the overall quality of the data, including qualifiers and limitations on the use of the data.

The performance-based control limits, established by the laboratory, that will be used to assess the data quality are presented in Tables 2 and 3. The summary data quality review will consist of a review of the following:

- Holding times;
- Initial and continuing calibrations;
- System performance;
- Method blanks;
- Matrix spike / matrix spike duplicates;
- Field duplicates;
- Compound identification;
- Compound quantification; and
- Reporting limits.

The summary data quality review will not include checking calculations and raw data. In the event that the summary data quality review identifies a significant problem that may affect data usability, the ERM QA Coordinator or ERM Project Manager will contact the lab to initiate corrective action. If necessary, review of raw data associated with the identified problem will be performed. This further review will focus only
on the identified problem, and will not include any analyses that did not exhibit serious deficiencies for an important target analyte.

5.3 **RECONCILIATION WITH USER REQUIREMENTS**

The purpose of data validation is to determine the quality of the data gathered for each point. Data is evaluated against performance-based control limits. Non-conforming data may be either qualified or rejected. The data qualifiers used for this project will be taken from the USEPA function guidelines for data review. Rejected data will not be used.

Limitations on data use that are found during validation will be discussed in the data summary report. Data users will be informed on the limitations of the data and the potential effect on data interpretation and analysis.
REFERENCES


Tables
### Table 1

**Summary of Sample Analyses and Laboratory Control Limits**

**Central Mine Group and Wide Awake Mine**

**Sulphur Creek Mining District, Colusa County, California**

<table>
<thead>
<tr>
<th>Sample Materials</th>
<th>Parameter</th>
<th>Analytical Method</th>
<th>Method Detection Limit</th>
<th>Method Reporting Limit</th>
<th>Laboratory Information ¹</th>
<th>Laboratory Control Limits</th>
<th>Sample Collection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Duplicate RPD</td>
<td>Percent Recovery</td>
<td>RPD</td>
</tr>
<tr>
<td>Waste Rock,</td>
<td>STL Mercury</td>
<td>CalWET</td>
<td>0.0001 mg/L</td>
<td>0.02 mg/L</td>
<td>20</td>
<td>75-125</td>
<td>20</td>
</tr>
<tr>
<td>Tailings,</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ceramic, Brick,</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>and Concrete</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Mercury</td>
<td>USEPA 7471A</td>
<td></td>
<td>0.0025 mg/kg</td>
<td>0.02 mg/kg</td>
<td>20</td>
<td>75-125</td>
<td>20</td>
</tr>
</tbody>
</table>

**Notes:**

¹Per TestAmerica Laboratories Inc.

CalWET = California Waste Extraction Test
Table 2  
Laboratory Methods and Control Limits - Water Samples  
Central Mine Group and Wide Awake Mine  
Sulphur Creek Mining District, Colusa County, California

<table>
<thead>
<tr>
<th>Sample Group</th>
<th>Constituent</th>
<th>Method</th>
<th>MDL</th>
<th>MRL</th>
<th>Units</th>
<th>Laboratory Control Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>RPD</td>
<td>%Rec</td>
<td>RPD</td>
<td>%Rec</td>
</tr>
<tr>
<td>Rinsate Blanks</td>
<td>Mercury</td>
<td>USEPA 1631</td>
<td>0.077</td>
<td>0.5</td>
<td>ng/L</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>25</td>
</tr>
</tbody>
</table>

**Notes:**
- %Rec - Percent recovery
- ng/L - nanograms per liter
- MDL - Method Detection Limit
- MRL - Method Reporting Limit
- RPD - relative percent difference
- USEPA - United States Environmental Protection Agency
## Table 3

**Sample Container, Preservation, and Holding Time Requirements**  
**Central Mine Group and Wide Awake Mine**  
**Sulphur Creek Mining District, Colusa County, California**

<table>
<thead>
<tr>
<th>Analysis</th>
<th>Method</th>
<th>Preservation</th>
<th>Hold Time (days)</th>
<th>Container</th>
<th>Amount Needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste Rock, Tailings, and Building Material Samples</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STLC Mercury</td>
<td>CalWET</td>
<td>NA (cool ≤ 6°C)</td>
<td>90</td>
<td>glass jar (8 oz)</td>
<td>250 g</td>
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<tr>
<td>Water Samples</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Mercury</td>
<td>USEPA 1631</td>
<td>NA (cool ≤ 6°C)</td>
<td>28</td>
<td>glass bottle (12 oz)</td>
<td>12 oz</td>
</tr>
</tbody>
</table>

**Notes:**  
CalWET = California Waste Extraction Test  
g = Grams  
NA = Not applicable  
oz = Ounce  
STLC = Soluble Threshold Limit Concentration  
USEPA - United States Environmental Protection Agency
Attachment 1
Test America Laboratory Quality Assurance Manual

(Available on CD by request)
Appendix D
Waste Characterization Laboratory Reports
## SAMPLE PREPARATION AND ANALYTICAL PROCEDURES

<table>
<thead>
<tr>
<th>Method Code</th>
<th>Number of Samples</th>
<th>Code Description</th>
<th>Test Wgt (g)</th>
<th>Report Status</th>
<th>Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>R200-250</td>
<td>11</td>
<td>Crush, split and pulverize 250 g rock to 200 mesh</td>
<td>30</td>
<td>Completed</td>
<td>VAN</td>
</tr>
<tr>
<td>3B01</td>
<td>11</td>
<td>Fire assay fusion Au by ICP-ES</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

## ADDITIONAL COMMENTS

Acme does not accept responsibility for samples left at the laboratory after 90 days without prior written instructions for sample storage or return.

### SAMPLE DISPOSAL

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>STOR-PLP</td>
<td>Store After 90 days Invoice for Storage</td>
</tr>
<tr>
<td>DISP-RJT</td>
<td>Dispose of Reject After 90 days</td>
</tr>
</tbody>
</table>

**Disclaimer:**

This report supersedes all previous preliminary and final reports with this file number dated prior to the date on this certificate. Signature indicates final approval; preliminary reports are unsigned and should be used for reference only.

All results are considered the confidential property of the client. Acme assumes the liabilities for actual cost of analysis only.

** Asterisk indicates that an analytical result could not be provided due to unusually high levels of interference from other elements.
## CERTIFICATE OF ANALYSIS

<table>
<thead>
<tr>
<th>Method</th>
<th>Analyte</th>
<th>Unit</th>
<th>Wght Kg</th>
<th>Au ppb</th>
</tr>
</thead>
<tbody>
<tr>
<td>WA-WR-C1</td>
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<td>1.87</td>
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<td>WA-WS-C2</td>
<td>Rock</td>
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<td>1.81</td>
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This report supersedes all previous preliminary and final reports with this file number dated prior to the date on this certificate. Signature indicates final approval; preliminary reports are unsigned and should be used for reference only.
### QUALITY CONTROL REPORT

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<th>Wgt</th>
<th>Au</th>
<th>kg</th>
<th>ppb</th>
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<tr>
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<td></td>
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<td></td>
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<td></td>
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<tr>
<td>STD OXH66</td>
<td>Standard</td>
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<td></td>
<td></td>
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<td>0.01</td>
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<td>STD OXD73 Expected</td>
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<td></td>
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<tr>
<td>STD OXH66 Expected</td>
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</tr>
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<td></td>
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<tr>
<td>BLK</td>
<td>Blank</td>
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<td>&lt;2</td>
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<tr>
<td>BLK</td>
<td>Blank</td>
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<td>&lt;2</td>
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<td>BLK</td>
<td>Blank</td>
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<td>&lt;2</td>
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<td>Prep Wash</td>
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<td>&lt;0.01</td>
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</tr>
</tbody>
</table>

This report supersedes all previous preliminary and final reports with this file number dated prior to the date on this certificate. Signature indicates final approval; preliminary reports are unsigned and should be used for reference only.
ANALYTICAL REPORT

Job Number: 720-26781-1
Job Description: Bellview Creek

For:
ERM-West
915 118th Avenue SE, Suite 130
Bellevue, WA 98005
Attention: Mike Arnold

_____________________________________________
Designee for
Dimple Sharma
Project Manager I
dimple.sharma@testamericainc.com
04/02/2010

cc: Mr. Lance Jones

CA ELAP Certification # 2496
The Chain(s) of Custody are included and are an integral part of this report.
The report shall not be reproduced except in full, without the written approval of the laboratory. The client, by accepting
this report, also agrees not to alter any reports whether in the hard copy or electronic format and to use reasonable
efforts to preserve the reports in the form and substance originally provided by TestAmerica.
A trip blank is required to be provided for volatile analyses. If trip blank results are not included in the report, either the
trip blank was not submitted or requested to be analyzed.

TestAmerica Laboratories, Inc.
TestAmerica San Francisco 1220 Quarry Lane, Pleasanton, CA 94566
Tel (925) 484-1919  Fax (925) 600-3002  www.testamericainc.com
Comments
No additional comments.

Receipt
Received sample CH-CO-01 on 3/23/10.

All other samples were received in good condition within temperature requirements.

Metals
Method 7471A: The matrix spike / matrix spike duplicate (MS/MSD) precision for batch 68709 was outside control limits. Non-homogeneity of the sample matrix is suspected. The associated laboratory control sample / laboratory control sample duplicate (LCS/LCSD) precision met acceptance criteria.

No other analytical or quality issues were noted.

General Chemistry
No analytical or quality issues were noted.
## EXECUTIVE SUMMARY - Detections

Client: ERM-West  
Job Number: 720-26781-1

<table>
<thead>
<tr>
<th>Lab Sample ID</th>
<th>Client Sample ID</th>
<th>Result / Qualifier</th>
<th>Reporting Limit</th>
<th>Units</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>720-26781-1</td>
<td>CE-RT1-BR-01</td>
<td>Mercury</td>
<td>0.33</td>
<td>0.020</td>
<td>mg/Kg</td>
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<td></td>
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<td>7471A</td>
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<td>720-26781-2</td>
<td>CE-RT1-CE-01</td>
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<td>0.97</td>
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<td>7471A</td>
</tr>
<tr>
<td>720-26781-5</td>
<td>MA-WR-C1</td>
<td>Soluble</td>
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<td>720-26781-6</td>
<td>MA-WR-C2</td>
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<td>pH-Soluble</td>
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<td>9045C</td>
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<td>720-26781-7</td>
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<td>SU</td>
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<td>pH-Soluble</td>
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<td></td>
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<tr>
<td>720-26781-8</td>
<td>WE-WR-C1</td>
<td>Soluble</td>
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<td>0.100</td>
<td>SU</td>
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<td>pH-Soluble</td>
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<td>720-26781-9</td>
<td>WE-WR-C2</td>
<td>Soluble</td>
<td>5.69</td>
<td>0.100</td>
<td>SU</td>
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<td>9045C</td>
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<tr>
<td>720-26781-10</td>
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<td>SU</td>
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<td></td>
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<td>7471A</td>
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</tbody>
</table>

TestAmerica San Francisco
## EXECUTIVE SUMMARY - Detections

**Client:** ERM-West  
**Job Number:** 720-26781-1

<table>
<thead>
<tr>
<th>Lab Sample ID</th>
<th>Client Sample ID</th>
<th>Result / Qualifier</th>
<th>Reporting Limit</th>
<th>Units</th>
<th>Method</th>
</tr>
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<tbody>
<tr>
<td>720-26781-12</td>
<td>WA-RT5-ASH-02</td>
<td>STLC Citrate</td>
<td>0.11</td>
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<td>720-26781-15</td>
<td>WA-RT6-BR-07</td>
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<td>WA-RT1-BR-01</td>
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<td>720-26781-25</td>
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<td><strong>Matrix: Solid</strong></td>
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<td>SW846 7470A</td>
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<td>SW846 7471A</td>
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**Lab References:**
- TAL CHI = TestAmerica Chicago
- TAL SF = TestAmerica San Francisco

**Method References:**
- ASTM = ASTM International
- CA-WET = California Waste Extraction Test, from Title 22
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<th>Date/Time Received</th>
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### Analytical Data

**Client:** ERM-West  
**Job Number:** 720-26781-1

**Client Sample ID:** CE-RT1-BR-01  
**Lab Sample ID:** 720-26781-1  
**Client Matrix:** Solid  
**Date Sampled:** 03/18/2010 1720  
**Date Received:** 03/22/2010 1800

#### 7470A Mercury (CVAA)-STLC Citrate

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#### 7471A Mercury (CVAA)

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# Analytical Data

Client: ERM-West  
Job Number: 720-26781-1

**Client Sample ID:** CE-RT1-CE-01  
**Lab Sample ID:** 720-26781-2  
**Client Matrix:** Solid  
**Date Sampled:** 03/18/2010 1725  
**Date Received:** 03/22/2010 1800  

### 7470A Mercury (CVAA)-STLC Citrate

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### 7471A Mercury (CVAA)

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Job Number: 720-26781-1

Client Sample ID: CE-WR-C3  
Lab Sample ID: 720-26781-3  
Client Matrix: Solid  
Date Sampled: 03/18/2010 1750  
Date Received: 03/22/2010 1800

7470A Mercury (CVAA)-STLC Citrate

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Method: 7470A  
Preparation: 7470A  
Dilution: 1.0  
Leachate Batch: 720-68530  
Initial Weight/Volume: 1 mL  
Final Weight/Volume: 50 mL

Analysis Batch: 720-68880  
Prep Batch: 720-68768  
Leachate Batch: 720-68530  
Instrument ID: LL_HG Analyzer  
Lab File ID: N/A

Date Analyzed: 04/02/2010 1421  
Date Prepared: 04/01/2010 1226  
Date Leached: 03/29/2010 1613
Client: ERM-West

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**7470A Mercury (CVAA)-STLC Citrate**

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### 7470A Mercury (CVAA)-STLC Citrate

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**Method:** 7470A  | **Analysis Batch:** 720-68880  | **Instrument ID:** LL_HG Analyzer  
**Preparation:** 7470A  | **Prep Batch:** 720-68768  | **Lab File ID:** N/A  
**Dilution:** 1.0  | **Leachate Batch:** 720-68530  | **Initial Weight/Volume:** 1 mL  
**Date Analyzed:** 04/02/2010 1431  
**Date Prepared:** 04/01/2010 1226  
**Date Leached:** 03/29/2010 1613
Client Sample ID: MA-WR-C2
Lab Sample ID: 720-26781-6
Client Matrix: Solid

Date Sampled: 03/19/2010 0945
Date Received: 03/22/2010 1800

7470A Mercury (CVAA)-STLC Citrate

Method: 7470A
Preparation: 7470A
Dilution: 1.0
Date Analyzed: 04/02/2010 1433
Date Prepared: 04/01/2010 1226
Date Leached: 03/29/2010 1613

Analysis Batch: 720-68880
Prep Batch: 720-68768
Leachate Batch: 720-68530
Instrument ID: LL_HG Analyzer
Lab File ID: N/A
Initial Weight/Volume: 1 mL
Final Weight/Volume: 50 mL

Analyte DryWt Corrected: N Result (mg/L) Qualifier RL
Mercury ND 0.10
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**Analytical Data**

Client: ERM-West  
Job Number: 720-26781-1  
Date Sampled: 03/19/2010 1004  
Date Received: 03/22/2010 1800  

Client Sample ID: MA-WR-C3  
Lab Sample ID: 720-26781-7  
Client Matrix: Solid  

7470A Mercury (CVAA)-STLC Citrate

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<td>Final Weight/Volume:</td>
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Page 14 of 76
**Analytical Data**

**Client:** ERM-West  
**Job Number:** 720-26781-1

**Client Sample ID:** WE-WR-C1  
**Lab Sample ID:** 720-26781-8  
**Date Sampled:** 03/19/2010 1315  
**Date Received:** 03/22/2010 1800

**Client Matrix:** Solid  
**Date Analyzed:** 04/02/2010 1438  
**Date Prepared:** 04/01/2010 1226  
**Date Leached:** 03/29/2010 1613

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### 7470A Mercury (CVAA)-STLC Citrate

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*Page 15 of 76*
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**7470A Mercury (CVAA)-STLC Citrate**

- **Method:** 7470A
- **Preparation:** 7470A
- **Dilution:** 1.0
- **Date Analyzed:** 04/02/2010 1440
- **Date Prepared:** 04/01/2010 1226
- **Date Leached:** 03/29/2010 1613
- **Analysis Batch:** 720-68880
- **Prep Batch:** 720-68768
- **Leachate Batch:** 720-68530
- **Instrument ID:** LL_HG Analyzer
- **Lab File ID:** N/A
- **Initial Weight/Volume:** 1 mL
- **Final Weight/Volume:** 50 mL
- **Result (mg/L):** ND
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**Method:** 7470A  
**Analysis Batch:** 720-68880  
**Instrument ID:** LL_HG Analyzer  
**Preparation:** 7470A  
**Prep Batch:** 720-68768  
**Lab File ID:** N/A  
**Dilution:** 1.0  
**Leachate Batch:** 720-68530  
**Initial Weight/Volume:** 1 mL  
**Final Weight/Volume:** 50 mL  

**Date Sampled:** 03/19/2010 1316  
**Date Received:** 03/22/2010 1800  
**Date Analyzed:** 04/02/2010 1443  
**Date Prepared:** 04/01/2010 1226  
**Date Leached:** 03/29/2010 1613
## Analytical Data

**Client:** ERM-West  
**Job Number:** 720-26781-1

### Client Sample ID: WA-RT5-BR-05

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#### 7470A Mercury (CVAA)-STLC Citrate

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#### 7471A Mercury (CVAA)

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Analytical Data

Client: ERM-West

Client Sample ID: WA-RT5-ASH-02
Lab Sample ID: 720-26781-12
Client Matrix: Solid

Date Sampled: 03/18/2010 1535
Date Received: 03/22/2010 1800

7470A Mercury (CVAA)-STLC Citrate

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Method: 7470A
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Dilution: 1.0
Date Analyzed: 04/02/2010 1447
Date Prepared: 04/01/2010 1226
Date Leached: 03/29/2010 1613

Analysis Batch: 720-68880
Prep Batch: 720-68768
Leachate Batch: 720-68530
Instrument ID: LL_HG Analyzer
Lab File ID: N/A
Initial Weight/Volume: 1 mL
Final Weight/Volume: 50 mL
### Analytical Data

**Client:** ERM-West  
**Job Number:** 720-26781-1

**Client Sample ID:** WA-RT6-BR-07  
**Lab Sample ID:** 720-26781-15  
**Client Matrix:** Solid  
**Date Sampled:** 03/18/2010 1550  
**Date Received:** 03/22/2010 1800

#### 7470A Mercury (CVAA)-STLC Citrate

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#### 7471A Mercury (CVAA)

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### 7471A Mercury (CVAA)

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Client: ERM-West

Client Sample ID: WA-CT-C4
Lab Sample ID: 720-26781-17
Client Matrix: Solid

Date Sampled: 03/18/2010 1605
Date Received: 03/22/2010 1800

Method: 7470A
Preparation: 7470A
Dilution: 1.0
Date Analyzed: 04/02/2010 1503
Date Prepared: 04/01/2010 1226
Date Leached: 03/29/2010 1616

Instrument ID: LL_HG Analyzer
Lab File ID: N/A
Initial Weight/Volume: 1 mL
Final Weight/Volume: 50 mL

Analyte | DryWt Corrected: N | Result (mg/L) | Qualifier | RL
---|---|---|---|---
Mercury | ND | | | 0.10

7470A Mercury (CVAA)-STLC Citrate
### 7470A Mercury (CVAA)-STLC Citrate

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### 7471A Mercury (CVAA)

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### Analytical Data

**Client:** ERM-West  
**Job Number:** 720-26781-1

**Client Sample ID:** CE-CT-C1  
**Lab Sample ID:** 720-26781-19  
**Client Matrix:** Solid  
**Date Sampled:** 03/18/2010 1705  
**Date Received:** 03/22/2010 1800

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**7470A Mercury (CVAA)-STLC Citrate**

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**Method:** 7470A  
**Analysis Batch:** 720-68880  
**Instrument ID:** LL_HG Analyzer

**Preparation:** 7470A  
**Prep Batch:** 720-68768  
**Lab File ID:** N/A

**Dilution:** 1.0  
**Leachate Batch:** 720-68532  
**Initial Weight/Volume:** 1 mL

**Date Analyzed:** 04/02/2010 1507  
**Final Weight/Volume:** 50 mL

**Date Prepared:** 04/01/2010 1226

**Date Leached:** 03/29/2010 1616

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### 7470A Mercury (CVAA)-STLC Citrate

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**Method:** 7470A  
**Analysis Batch:** 720-68880  
**Preparation:** 7470A  
**Prep Batch:** 720-68768  
**Dilution:** 1.0  
**Leachate Batch:** 720-68532  
**Date Analyzed:** 04/02/2010 1510  
**Date Prepared:** 04/01/2010 1226  
**Date Leached:** 03/29/2010 1616  
**Instrument ID:** LL_HG Analyzer  
**Lab File ID:** N/A  
**Initial Weight/Volume:** 1 mL  
**Final Weight/Volume:** 50 mL
## Analytical Data

### Sample Information
- **Client:** ERM-West
- **Client Sample ID:** WA-WR-C1
- **Lab Sample ID:** 720-26781-21
- **Client Matrix:** Solid
- **Date Sampled:** 03/18/2010 1115
- **Date Received:** 03/22/2010 1800

### Method Information
- **Method:** 7470A
- **Analysis Batch:** 720-68866
- **Instrument ID:** LL_HG Analyzer
- **Preparation:** 7470A
- **Prep Batch:** 720-68772
- **Lab File ID:** N/A
- **Dilution:** 1.0
- **Leachate Batch:** 720-68532
- **Initial Weight/Volume:** 1 mL
- **Final Weight/Volume:** 50 mL
- **Date Analyzed:** 04/02/2010 1240
- **Date Prepared:** 04/01/2010 1311
- **Date Leached:** 03/29/2010 1616

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**Date Sampled:** 03/18/2010 1235  
**Date Received:** 03/22/2010 1800

### 7471A Mercury (CVAA)

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**Instrument ID:** LL_HG Analyzer  
**Lab File ID:** N/A

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**Initial Weight/Volume:** 0.59 g  
**Final Weight/Volume:** 50 mL

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**Analytical Data**

Client: ERM-West  
Job Number: 720-26781-1

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**7470A Mercury (CVAA)-STLC Citrate**

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**7471A Mercury (CVAA)**

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Job Number: 720-26781-1

Client Sample ID: WA-WS-C2
Lab Sample ID: 720-26781-24
Client Matrix: Solid
Date Sampled: 03/18/2010 1205
Date Received: 03/22/2010 1800

### 7470A Mercury (CVAA)-STLC Citrate

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Method: 7470A
Preparation: 7470A
Dilution: 1.0
Date Analyzed: 04/02/2010 1245
Date Prepared: 04/01/2010 1311
Date Leached: 03/29/2010 1616

Analysis Batch: 720-68866
Prep Batch: 720-68772
Leachate Batch: 720-68532

Instrument ID: LL_HG Analyzer
Lab File ID: N/A
Initial Weight/Volume: 1 mL
Final Weight/Volume: 50 mL

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## 7470A Mercury (CVAA)-STLC Citrate

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**Prep Batch:** 720-68772  
**Leachate Batch:** 720-68532  
**Instrument ID:** LL_HG Analyzer  
**Lab File ID:** N/A  
**Initial Weight/Volume:** 1 mL  
**Final Weight/Volume:** 50 mL
**Analytical Data**

Client: ERM-West

**Client Sample ID:** WA-RT2-BR-2

**Lab Sample ID:** 720-26781-26

**Client Matrix:** Solid

**Date Sampled:** 03/18/2010 1308

**Date Received:** 03/22/2010 1800

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### 7470A Mercury (CVAA)-STLC Citrate

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**Method:** 7470A  
**Analysis Batch:** 720-68866  
**Preparation:** 7470A  
**Prep Batch:** 720-68772  
**Dilution:** 1.0  
**Leachate Batch:** 720-68532  
**Date Analyzed:** 04/02/2010 1254  
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**Date Leached:** 03/29/2010 1616  
**Instrument ID:** LL_HG Analyzer  
**Lab File ID:** N/A  
**Initial Weight/Volume:** 1 mL  
**Final Weight/Volume:** 50 mL

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### 7471A Mercury (CVAA)

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**Method:** 7471A  
**Analysis Batch:** 720-68545  
**Preparation:** 7471A  
**Prep Batch:** 720-68500  
**Dilution:** 5.0  
**Initial Weight/Volume:** 0.58 g  
**Final Weight/Volume:** 50 mL  
**Instrument ID:** LL_HG Analyzer  
**Lab File ID:** N/A  
**Date Analyzed:** 03/29/2010 1746  
**Date Prepared:** 03/29/2010 1002
Analytical Data

Client: ERM-West
Job Number: 720-26781-1

Client Sample ID: WA-WR-C4
Lab Sample ID: 720-26781-27
Client Matrix: Solid

Date Sampled: 03/18/2010 1320
Date Received: 03/22/2010 1800

7470A Mercury (CVAA)-STLC Citrate

Method: 7470A
Preparation: 7470A
Dilution: 1.0
Date Analyzed: 04/02/2010 1257
Date Prepared: 04/01/2010 1311
Date Leached: 03/29/2010 1616

Analysis Batch: 720-68866
Prep Batch: 720-68772
Leachate Batch: 720-68532

Lab File ID: N/A
Initial Weight/Volume: 1 mL
Final Weight/Volume: 50 mL

Instrument ID: LL_HG Analyzer

Analyte     DryWt Corrected: N     Result (mg/L)     Qualifier     RL
Mercury     ND                     ND                 0.10

TestAmerica San Francisco
## 7470A Mercury (CVAA)-STLC Citrate

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## 7471A Mercury (CVAA)

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**Analytical Data**

**Client:** ERM-West  
**Job Number:** 720-26781-1

**Client Sample ID:** WA-RT3-CO-1  
**Lab Sample ID:** 720-26781-29  
**Client Matrix:** Solid  
**Date Sampled:** 03/18/2010 1500  
**Date Received:** 03/22/2010 1800

### 7470A Mercury (CVAA)-STLC Citrate

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**Lab File ID:** N/A  
**Dilution:** 1.0  
**Leachate Batch:** 720-68532  
**Initial Weight/Volume:** 1 mL  
**Date Analyzed:** 04/02/2010 1302  
**Date Prepared:** 04/01/2010 1311  
**Date Leached:** 03/29/2010 1616

### 7471A Mercury (CVAA)

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**Instrument ID:** LL_HG Analyzer  
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**Lab File ID:** N/A  
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**Date Prepared:** 03/29/2010 1002  
**Final Weight/Volume:** 50 mL
## Analytical Data

**Client:** ERM-West  
**Job Number:** 720-26781-1

**Client Sample ID:** CH-WR-C1  
**Lab Sample ID:** 720-26781-31  
**Client Matrix:** Solid  
**Date Sampled:** 03/19/2010 1455  
**Date Received:** 03/22/2010 1800

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### 7470A Mercury (CVAA)-STLC Citrate

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**Method:** 7470A  
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**Leachate Batch:** 720-68532  
**Instrument ID:** LL_HG Analyzer  
**Lab File ID:** N/A  
**Initial Weight/Volume:** 1 mL  
**Final Weight/Volume:** 50 mL

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**TestAmerica San Francisco**  
**Page 35 of 76**
### 7470A Mercury (CVAA)-STLC Citrate

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**Client:** ERM-West  
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**Analysis Batch:** 500-83087  
**Client Sample ID:** MA-WR-C3  
**Lab Sample ID:** 720-26781-7  
**Client Matrix:** Solid  
**DryWt Corrected:** N
### General Chemistry

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**Details:**
- **Client:** ERM-West
- **Job Number:** 720-26781-1
- **Client Sample ID:** WE-WR-C1
- **Lab Sample ID:** 720-26781-8
- **Client Matrix:** Solid
- **Date Sampled:** 03/19/2010 1315
- **Date Received:** 03/22/2010 1800
- **Date Analyzed (Start):** 03/31/2010 1223
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- **Date Prepared:** 03/31/2010 0820
- **DryWt Corrected:** N

**Analysis Summary:**
- **Sulfide Result:** ND (mg/Kg)
- **pH-Soluble Result:** 4.96 (SU)

**Notes:**
- Analysis performed by TestAmerica San Francisco.
### General Chemistry

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**DryWt Corrected: N**
## General Chemistry

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| Date Analyzed (End): | 03/31/2010 1225  
| DryWt Corrected: | N          |
| pH-Soluble    | 4.93   | SU   |       | 0.100 | 1.0 | 9045C         |
| Analysis Batch: | 720-68516  
| Date Analyzed: | 03/29/2010 1344  
| DryWt Corrected: | N          |
### General Chemistry

**Client Sample ID:** WA-WR-C1  
**Lab Sample ID:** 720-26781-21  
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**Client:** ERM-West  
**Job Number:** 720-26781-1

#### General Chemistry

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### TestAmerica San Francisco

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# Data Reporting Qualifiers

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TestAmerica San Francisco
## QC Association Summary

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### Report Basis
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TestAmerica San Francisco
## QC Association Summary

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### Prep Batch: 500-83028

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### Report Basis

- S = Soluble
- T = Total
Quality Control Results

**Method Blank - Batch: 720-68768**

- **Lab Sample ID:** MB 720-68768/1-A
- **Client Matrix:** Water
- **Date Analyzed:** 04/02/2010 1403
- **Date Prepared:** 04/01/2010 1226
- **Analysis Batch:** 720-68880

**Method: 7470A**
**Preparation: 7470A**
- **Instrument ID:** LL_HG Analyzer
- **Lab File ID:** N/A
- **Initial Weight/Volume:** 1.0 mL
- **Final Weight/Volume:** 1.0 mL

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<th>Analyte</th>
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<th>RL</th>
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**Lab Control Sample/ Lab Control Sample Duplicate Recovery Report - Batch: 720-68768**

**LCS Lab Sample ID:** LCS 720-68768/2-A
- **Client Matrix:** Water
- **Date Analyzed:** 04/02/2010 1405
- **Date Prepared:** 04/01/2010 1226
- **Analysis Batch:** 720-68880

**Method: 7470A**
**Preparation: 7470A**
- **Instrument ID:** LL_HG Analyzer
- **Lab File ID:** N/A
- **Initial Weight/Volume:** 25 mL
- **Final Weight/Volume:** 50 mL

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<th>LCSD</th>
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**LCSD Lab Sample ID:** LCSD 720-68768/3-A
- **Client Matrix:** Water
- **Date Analyzed:** 04/02/2010 1408
- **Date Prepared:** 04/01/2010 1226
- **Analysis Batch:** 720-68880

**Method: 7470A**
**Preparation: 7470A**
- **Instrument ID:** LL_HG Analyzer
- **Lab File ID:** N/A
- **Initial Weight/Volume:** 25 mL
- **Final Weight/Volume:** 50 mL

TestAmerica San Francisco
Client: ERM-West

**Matrix Spike/Matrix Spike Duplicate Recovery Report - Batch: 720-68768**

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<th>MS Lab Sample ID</th>
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**Method: 7470A**

- **Preparation: 7470A**
- **STLC Citrate**

**Instrument ID:** LL_HG Analyzer  
**Lab File ID:** N/A  
**Initial Weight/Volume:** 1 mL  
**Final Weight/Volume:** 50 mL

**Analyte** | MS % Rec. | MSD % Rec. | Limit | RPD | RPD Limit | MS Qual | MSD Qual
---|----------|--------|-------|-----|----------|--------|--------
Mercury | 98       | 92     | 75 - 125 | 5   | 20

---

Preliminary Data
### Quality Control Results

**Client:** ERM-West  
**Job Number:** 720-26781-1

#### Method Blank - Batch: 720-68772

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**Analysis Batch:** 720-68866  
**Prep Batch:** 720-68772  
**Units:** mg/L  
**Method:** 7470A  
**Preparation:** 7470A

**Instrument ID:** LL_HG Analyzer  
**Lab File ID:** N/A  
**Initial Weight/Volume:** 25 mL  
**Final Weight/Volume:** 50 mL

#### Lab Control Sample/

**Lab Control Sample Duplicate Recovery Report - Batch: 720-68772**

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**Analysis Batch:** 720-68866  
**Prep Batch:** 720-68772  
**Units:** mg/L  
**Method:** 7470A  
**Preparation:** 7470A

**Instrument ID:** LL_HG Analyzer  
**Lab File ID:** N/A  
**Initial Weight/Volume:** 25 mL  
**Final Weight/Volume:** 50 mL

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**Analysis Batch:** 720-68866  
**Prep Batch:** 720-68772  
**Units:** mg/L  
**Method:** 7470A  
**Preparation:** 7470A

**Instrument ID:** LL_HG Analyzer  
**Lab File ID:** N/A  
**Initial Weight/Volume:** 25 mL  
**Final Weight/Volume:** 50 mL

#### Analyte Results

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**Matrix Spike/Duplicate Recovery Report - Batch: 720-68772**

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**Method: 7470A**
**Preparation: 7470A**
**STLC Citrate**

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### Quality Control Results

**Job Number:** 720-26781-1  
**Client:** ERM-West

#### Method Blank - Batch: 720-68500

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**Analyte** | **Result** | **Qual** | **RL** |
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**Preparation: 7471A**

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**Analyte** | **Result** | **Qual** | **RL** |
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**Analyte** | **Result** | **Qual** | **RL** |
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#### % Rec.  

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<tbody>
<tr>
<td>LL_HG Analyzer</td>
<td>N/A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Result</th>
<th>Qual</th>
<th>RL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury</td>
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<td>0.020</td>
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## Lab Control Sample/ Lab Control Sample Duplicate Recovery Report - Batch: 720-68595

<table>
<thead>
<tr>
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<th>Client Matrix</th>
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<th>Date Analyzed</th>
<th>Date Prepared</th>
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</thead>
<tbody>
<tr>
<td>LCS 720-68595/2-A</td>
<td>Solid</td>
<td>1.0</td>
<td>03/30/2010</td>
<td>1822</td>
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</table>

<table>
<thead>
<tr>
<th>Analysis Batch</th>
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<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>720-68655</td>
<td>720-68595</td>
<td>mg/Kg</td>
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<table>
<thead>
<tr>
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<table>
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<th>LCSD % Rec.</th>
<th>Limit</th>
<th>RPD</th>
<th>RPD Limit</th>
<th>LCS Qual</th>
<th>LCSD Qual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury</td>
<td>101</td>
<td>101</td>
<td>80 - 120</td>
<td>0</td>
<td>20</td>
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<table>
<thead>
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<th>Dilution</th>
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<th>Date Prepared</th>
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<tbody>
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<td>03/30/2010</td>
<td>1825</td>
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<table>
<thead>
<tr>
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<th>Prep Batch</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
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<td>720-68595</td>
<td>mg/Kg</td>
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<table>
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<tr>
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<th>RPD</th>
<th>RPD Limit</th>
<th>LCS Qual</th>
<th>LCSD Qual</th>
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<tbody>
<tr>
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<td>80 - 120</td>
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## Quality Control Results

**Job Number:** 720-26781-1

### Method Blank - Batch: 720-68709

<table>
<thead>
<tr>
<th>Lab Sample ID</th>
<th>Analysis Batch: 720-68776</th>
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</thead>
<tbody>
<tr>
<td>MB 720-68709/1-A</td>
<td>Prep Batch: 720-68709</td>
</tr>
<tr>
<td>Client Matrix:</td>
<td>Units: mg/Kg</td>
</tr>
<tr>
<td>Solid</td>
<td></td>
</tr>
<tr>
<td>Dilution: 1.0</td>
<td></td>
</tr>
<tr>
<td>Date Analyzed: 04/01/2010 1214</td>
<td></td>
</tr>
<tr>
<td>Date Prepared: 03/31/2010 1617</td>
<td></td>
</tr>
<tr>
<td>Prep Batch: 720-68709</td>
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</tr>
<tr>
<td>Analysis Batch: 720-68776</td>
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#### Analyte

<table>
<thead>
<tr>
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### Lab Control Sample/ Lab Control Sample Duplicate Recovery Report - Batch: 720-68709

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<tr>
<td>Dilution: 1.0</td>
<td>Units: mg/Kg</td>
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<tr>
<td>Date Analyzed: 04/01/2010 1216</td>
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<tr>
<td>Date Prepared: 03/31/2010 1617</td>
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#### Analyte

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<th>LCSD</th>
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<th>RPD</th>
<th>RPD Limit</th>
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<th>LCSD Qual</th>
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<tbody>
<tr>
<td>Mercury</td>
<td>105</td>
<td>103</td>
<td>80 - 120</td>
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### Method: 7471A

**Preparation:** 7471A

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<td>Initial Weight/Volume: 0.59 g</td>
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<td>Final Weight/Volume: 50 mL</td>
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### LCSD Lab Sample ID: LCSD 720-68709/3-A

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<td>Prep Batch: 720-68709</td>
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<tr>
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</tr>
<tr>
<td>Date Prepared: 03/31/2010 1617</td>
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</tr>
<tr>
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</tr>
<tr>
<td>Analysis Batch: 720-68776</td>
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#### Analyte

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## Quality Control Results

**Client:** ERM-West

**Job Number:** 720-26781-1

### Method Blank - Batch: 500-83028

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<td>500-83028</td>
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<td>mg/Kg</td>
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<td>Date Analyzed:</td>
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<td>Date Prepared:</td>
<td>03/31/2010 0820</td>
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<table>
<thead>
<tr>
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<th>Qual</th>
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<tbody>
<tr>
<td>Sulfide</td>
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### Lab Control Sample - Batch: 500-83028

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<thead>
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<th>Analysis Batch:</th>
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<tr>
<td>Dilution:</td>
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<td>mg/Kg</td>
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<tr>
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### Matrix Spike/Matrix Spike Duplicate Recovery Report - Batch: 500-83028

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<thead>
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<th>Analysis Batch:</th>
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</tr>
<tr>
<td>Dilution:</td>
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<td>Date Analyzed:</td>
<td>03/31/2010 1228</td>
</tr>
<tr>
<td>Date Prepared:</td>
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<th>MSD Lab Sample ID:</th>
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<tbody>
<tr>
<td>Client Matrix:</td>
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<td>Prep Batch:</td>
<td>500-83028</td>
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<tr>
<td>Dilution:</td>
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<th>RPD Limit</th>
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<th>MSD Qual</th>
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</thead>
<tbody>
<tr>
<td>Sulfide</td>
<td>96</td>
<td>92</td>
<td>75 - 125</td>
<td>6</td>
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<td>Analyte</td>
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<td>Result</td>
<td>% Rec.</td>
<td>Limit</td>
<td>Qual</td>
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<tr>
<td>pH-Soluble</td>
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<td>6.990</td>
<td>100</td>
<td>99 - 101</td>
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**Duplicate - Batch: 720-68516**

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<th>Qual</th>
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<td>pH-Soluble</td>
<td>7.39</td>
<td>7.220</td>
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</table>
### Preliminary Data

**TestAmerica**
The LEADER IN ENVIRONMENTAL TESTING

**TESTAMERICA San Francisco Chain of Custody**
1220 Quarry Lane • Pleasanton CA 94566-4756

**Attn:** Mike Arnold
**Company:** ERM
**Address:** 915 118th Ave NE, Suite 130, Bellevue, WA
**Phone:** 425.462.8591 **Email:** mike.arnold@erm.com

**Bill To:** ERM
**Sampled By:** Mullermeister/Piper

#### Analysis Request

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Date</th>
<th>Time</th>
<th>Mat</th>
<th>Preserve</th>
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</thead>
<tbody>
<tr>
<td>CE-RT1-ER-01</td>
<td>3.18.10</td>
<td>17:20</td>
<td>brick</td>
<td>made</td>
</tr>
<tr>
<td>CE-RT1-CE-01</td>
<td></td>
<td>17:25</td>
<td></td>
<td>crimped</td>
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<tr>
<td>CE-WR-C3</td>
<td></td>
<td>17:50</td>
<td>soi</td>
<td>1</td>
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<tr>
<td>CE-WR-C4</td>
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<td>18:05</td>
<td>soil</td>
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<tr>
<td>MA-WR-C1</td>
<td>3.11.10</td>
<td>09:25</td>
<td>soil</td>
<td>2</td>
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<td>MA-WR-C2</td>
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<td>09:45</td>
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<td>10:04</td>
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<td>WE-WR-C1</td>
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<td>13:15</td>
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<tr>
<td>WE-WR-C2</td>
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<td>13:47</td>
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<td>WE-WR-CE-C1-DY</td>
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<td>13:16</td>
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#### Project Info.

<table>
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<th>Sample Receipt</th>
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<td># of Containers:</td>
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<table>
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<tr>
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<tbody>
<tr>
<td>5</td>
<td>3</td>
<td>2</td>
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<td>Other:</td>
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### Notes

- 1) Relinquished by:
  - Signature: 
  - Time: 

- 2) Relinquished by:
  - Signature: 
  - Time: 

- 3) Relinquished by:
  - Signature: 
  - Time: 

**Report:**
- Routine
- Level 3
- Level 4
- EDD
- State Tank
- Fund EDF

**Special Instructions / Comments:**
- Crushed ½ material in bag, used crushed material for Total Hg, unremoved for STLC test.
- Do STLC for Hg on uncrushed material in bag jar.

**See Terms and Conditions On reverse**

**TestAmerica SOL** - copy of 11.14.04 from CE-C (industry norm) Default for 11.15 in CE-C

**Rev09/09**
<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Date</th>
<th>Time</th>
<th>Matrix</th>
<th>Presence</th>
<th>Analysis Request</th>
</tr>
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<tbody>
<tr>
<td>WA-WP-C1</td>
<td>3.18.10</td>
<td>11:15</td>
<td>soil</td>
<td>none</td>
<td></td>
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<tr>
<td>WA-RT1-BR-01</td>
<td>12:35</td>
<td>brick</td>
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<td>WA-WS-C2</td>
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<td>brick</td>
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### Project Info

- **Project Name:**
- **PO#:**
- **Credit Card #:** Conforms to record.

### Sample Receipt

1) **Relinquished by:**
   - **Signature**
   - **Time**

2) **Relinquished by:**
   - **Signature**
   - **Time**

3) **Relinquished by:**
   - **Signature**
   - **Time**

### Date of Receipt

- **Received by:**
  - **Signature**
  - **Time**

### Special Instructions / Comments:
- Do STLC for Hg on uncrushed material in 80-150 lbs. 
- Haematoidin Chromate (HCl) for TGA analysis
- Hold brick for potential analysis
- Do STLC for uncrushed material
- Crush 1/2 of brick or concrete

---

*TestAmerica SF reports 801SM from C1-C12 (industry name). Default for 801SM is C2-C12*
## Project Info

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<tr>
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## Analysis Request

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### Analysis Request Details

- Sample ID: `CH-UW-C1`
- Date: 3.19.10
- Time: 14:55
- Mat: not
- Press: none

- Sample ID: `CH-CO-01`
- Date: 2.19.10
- Time: 15:20
- Mat: empty
- Press: none

## Report Details

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<td>Signature</td>
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<table>
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<tr>
<td>Printed Name</td>
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<tr>
<td>Company</td>
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</tbody>
</table>

## Additional Information

- Do NOT crush or uncrush material on 80% or 80% by weight.

---

*Note: TestAmerica SF reports 80% SM from C3 to C20 (industry norm). Default for B0151 is C3 to C20.*
Sharma, Dimple

From: Mike Arnold [Mike.Arnold@erm.com]
Sent: Wednesday, March 24, 2010 3:30 PM
To: Sharma, Dimple
Cc: Laura Tesch; Jennifer Barrett; Sarah Piper; hardrockgeo@yahoo.com
Subject: RE: Additional analyses for ERM 3/22/10 samples

Dimple,

Please also include the following analyses:

Page 1 of 4:
MA-WR-C3 - pH and total sulfides (USEPA 9034)

Thanks!
Mike

A. Michael Arnold, R.G., R.H.G.
Senior Project Manager
ERM
915 118th Avenue S.E., Suite 130
Bellevue, WA 98005

Office: +1 425 462 8591 x4004
Direct: +1 425 214 0454
Fax: +1 425 455 3573
Cell: +1 425 761 2603
mike.arnold@erm.com
www.erm.com

---

From: Mike Arnold
Sent: Wednesday, March 24, 2010 1:37 PM
To: 'dimple.sharma@testamericainc.com'
Cc: Laura Tesch; Jennifer Barrett; Sarah Piper; 'hardrockgeo@yahoo.com'
Subject: Additional analyses for ERM 3/22/10 samples

Dimple,

Please add the following analyses for the samples marked as "hold" on the attached chains of custody:

Page 1 of 4:
MA-WR-C3 - STLC Mercury by CalWET

Page 2 of 4:
WA-RT5-BR-05 - Total mercury by USEPA 7471A and STLC Mercury by CalWET
WA-RT5-ASH-02 - STLC Mercury by CalWET

3/24/2010
WA-RT5-ASH-03 - No analyses
WA-RT5-BR-06 - No analyses
WA-RT6-BR-07 - Total mercury by USEPA 7471A and STLC Mercury by CalWET
WA-RT6-BR-08 - Total mercury by USEPA 7471A and STLC Mercury by CalWET
WA-CT-C4 - STLC Mercury by CalWET
CE-CT-C2 - STLC Mercury by CalWET

Page 3 of 4:
WA-RT2-BR-2 - Total mercury by USEPA 7471A and STLC Mercury by CalWET

When the analyses are complete, please send the results to me and to the people indicated in the "cc" to this email.

Thanks!
Mike

A. Michael Arnold, R.G., R.H.G.
Senior Project Manager
ERM
915 118th Avenue S.E., Suite 130
Bellevue, WA 98005
Office: +1 425 462 8591 x4004
Direct: +1 425 214 0454
Fax: +1 425 455 3573
Cell: +1 425 761 2603
mike.arnold@erm.com
www.erm.com

This message contains information which may be confidential, proprietary, privileged, or otherwise protected by law from disclosure or use by a third party. If you have received this message in error, please contact us immediately at (925) 948-0458 and take the steps necessary to delete the message completely from your computer system. Thank you.

Please visit ERM's web site: http://www.erm.com
<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Date</th>
<th>Time</th>
<th>Mat/fix</th>
<th>Preserv</th>
<th>Description</th>
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<tbody>
<tr>
<td>WA-RT5-BR-05</td>
<td>3.18.10</td>
<td>1530</td>
<td>Soil</td>
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<td>None</td>
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<td>WA-RT5-BR-06</td>
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<td>WA-RT6-BR-07</td>
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<td>1605</td>
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<td></td>
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<tr>
<td>WA-RT7-BR-09</td>
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<td>1615</td>
<td>Brick</td>
<td></td>
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<tr>
<td>CE-CT-C1</td>
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<td>1705</td>
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<tr>
<td>CE-CT-C2</td>
<td></td>
<td>1710</td>
<td>Soil</td>
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**Project Info**

<table>
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<tr>
<th>Project Name:</th>
<th># of Containers:</th>
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<tbody>
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**Sample Receipt**

<table>
<thead>
<tr>
<th>Head Space</th>
<th>Temp</th>
<th>Conforms to record:</th>
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<tbody>
<tr>
<td></td>
<td>470c</td>
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</table>

1) Requisitioned by: Sarah Piper

2) Requisitioned by: Ed Martinez

3) Requisitioned by: TestAmerica

**Signature**

<table>
<thead>
<tr>
<th>Time</th>
<th>Printed Name:</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>TestAmerica</td>
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**Printed Name:**

<table>
<thead>
<tr>
<th>Date</th>
<th>Company:</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>TestAmerica</td>
</tr>
</tbody>
</table>
### Preliminary Data

**Report To**
- **Attn:** Mike Arnold
- **Company:** ERM
- **Address:** 915 11th Ave, SE, Suite 150, Bellevue, WA
- **Phone:** 425.962.8591
  - **Email:** mike.arnold@erm.com

**Bill To**
- **Company:** ERM
- **Sampled by:** Multi-minister/Piper
- **Attn:**

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Date</th>
<th>Time</th>
<th>Matrix</th>
<th>Preserve</th>
</tr>
</thead>
<tbody>
<tr>
<td>WA-WP-C1</td>
<td>3.18.10</td>
<td>1115</td>
<td>Soil</td>
<td>More</td>
</tr>
<tr>
<td>WA-RT1-BR-01</td>
<td>12.35</td>
<td></td>
<td>Brick</td>
<td></td>
</tr>
<tr>
<td>WA-ASH-01</td>
<td>11.55</td>
<td>12.05</td>
<td>Soil</td>
<td></td>
</tr>
<tr>
<td>WA-WS-C2</td>
<td>12.05</td>
<td>12.50</td>
<td>Soil</td>
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</tr>
<tr>
<td>WA-CT-C3</td>
<td>13.08</td>
<td>13.20</td>
<td>Brick</td>
<td></td>
</tr>
<tr>
<td>WA-RT2-BR-2</td>
<td>14.59</td>
<td>15.00</td>
<td>Crushed</td>
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</tr>
<tr>
<td>WA-WK-C4</td>
<td>15.15</td>
<td>15.15</td>
<td>Brick</td>
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</tbody>
</table>

**Number of Containers:**
- 2

### Project Info

- **Project Name:**
- **# of Containers:**
- **Head Space:**
- **Temp:** 4.7°C
- **Credit Card:**

### Sample Receipt

1. **Received by:** Sarah Pip 1500
   - **Signature:** ERM
   - **Printed Name:** Sarah Pip
   - **Date:** 3.22.10

2. **Received by:** Ed Martinez 1500
   - **Signature:** Ed Martinez
   - **Printed Name:** Ed Martinez
   - **Date:** 3.22.10

3. **Received by:**
   - **Signature:**
   - **Printed Name:**
   - **Date:**

**Special Instructions/Comments:**
- Do STL for kg on uncrushed material in bags jar
- Crush 1/2 of brick or concrete

**TAT**
- 5 Day
- 3 Day
- 2 Day
- 1 Day
- Other

**Fund EDF**

**Notes:**
- Reference #: 123716
- Date: 3.22.10 Page 3 of 4
- **Company:** TestAmerica
## Preliminary Data

**TestAmerica San Francisco Chain of Custody**  
1220 Quarry Lane • Pleasanton CA 94566-4756  
Phone: (650) 484-1919 • Fax: (650) 484-5902

**Reference #: 720-26781**  
Date: 3.22.10 Page 4 of 4

### Analysis Request

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Date</th>
<th>Time</th>
<th>Mat. no.</th>
<th>Preserv.</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH-WR-C1</td>
<td>3.19.10</td>
<td>1455</td>
<td>soil</td>
<td>name</td>
<td></td>
</tr>
<tr>
<td>CH-CO-D1</td>
<td>1520</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Project Info

<table>
<thead>
<tr>
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<th># of Containers</th>
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<tbody>
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</tbody>
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<table>
<thead>
<tr>
<th>PO#</th>
<th>Temp.</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>41.7°C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Credit Card#</th>
<th>Conforms to record:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Sample Receipt

1) **Received by:** Sarah Piper 1/30/10  
   **Signature:**  
   **Printed Name:** ERM

2) **Received by:** Ed Martinez 1/30/10  
   **Signature:**  
   **Printed Name:** FAS

3) **Received by:**  
   **Signature:**  
   **Printed Name:** Test America

**See Terms and Conditions of Service**  
"TestAmerica SF: recovers 1000 M L/min O2, 0.5 (industry norm) Default for 90-150 kg C.a.a.

### Analysis Request

- **Sample ID:** CH-WR-C1, CH-CO-D1
- **Date:** 3.19.10
- **Time:** 1455
- **Mat. no.:** soil
- **Preserv.:** name
- **Notes:** 1520, general note
## Login Sample Receipt Check List

**Client:** ERM-West  
**Job Number:** 720-26781-1

### Login Number: 26781  
**Creator:** Hoang, Julie  
**List Number:** 1

<table>
<thead>
<tr>
<th>Question</th>
<th>T / F / NA</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radioactivity either was not measured or, if measured, is at or below background</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>The cooler's custody seal, if present, is intact.</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>The cooler or samples do not appear to have been compromised or tampered with.</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>Samples were received on ice.</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>Cooler Temperature is acceptable.</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>Cooler Temperature is recorded.</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>COC is present.</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>COC is filled out in ink and legible.</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>COC is filled out with all pertinent information.</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>There are no discrepancies between the sample IDs on the containers and the COC.</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>Samples are received within Holding Time.</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>Sample containers have legible labels.</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>Containers are not broken or leaking.</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>Sample collection date/times are provided.</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>Appropriate sample containers are used.</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>Sample bottles are completely filled.</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>VOA sample vials do not have headspace or bubble is &lt;6mm (1/4&quot;) in diameter.</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>If necessary, staff have been informed of any short hold time or quick TAT needs</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>Multiphasic samples are not present.</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>Samples do not require splitting or compositing.</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>Is the Field Sampler’s name present on COC?</td>
<td>True</td>
<td></td>
</tr>
<tr>
<td>Sample Preservation Verified</td>
<td>True</td>
<td></td>
</tr>
</tbody>
</table>
Login Sample Receipt Check List

Client: ERM-West

Login Number: 26781
Creator: Lunt, Jeff T
List Number: 1

List Source: TestAmerica Chicago
List Creation: 03/30/10 10:36 AM

<table>
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<tr>
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<tr>
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<td></td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
<td>Sample Preservation Verified</td>
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<td></td>
</tr>
</tbody>
</table>
ANALYTICAL REPORT

Job Number: 720-26781-2
Job Description: Bellview Creek

For:
ERM-West
915 118th Avenue SE, Suite 130
Bellevue, WA  98005
Attention:  Mike Arnold

cc:  Mr. Lance Jones

CA ELAP Certification # 2496
The Chain(s) of Custody are included and are an integral part of this report.
The report shall not be reproduced except in full, without the written approval of the laboratory. The client, by accepting
this report, also agrees not to alter any reports whether in the hard copy or electronic format and to use reasonable
efforts to preserve the reports in the form and substance originally provided by TestAmerica.
A trip blank is required to be provided for volatile analyses. If trip blank results are not included in the report, either the
trip blank was not submitted or requested to be analyzed.
Comments
No additional comments.

Receipt
Received sample CH-CO-01 on 3/23/10.

All other samples were received in good condition within temperature requirements.

Metals
No analytical or quality issues were noted.

General Chemistry
No analytical or quality issues were noted.
## EXECUTIVE SUMMARY - Detections

**Client**: ERM-West  
**Job Number**: 720-26781-2

<table>
<thead>
<tr>
<th>Lab Sample ID</th>
<th>Client Sample ID</th>
<th>Result / Qualifier</th>
<th>Reporting Limit</th>
<th>Units</th>
<th>Method</th>
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<tbody>
<tr>
<td>720-26781-30</td>
<td>WA-RT4-BR-04</td>
<td>2.3</td>
<td>0.40</td>
<td>mg/Kg</td>
<td>7471A</td>
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</tbody>
</table>

TestAmerica San Francisco
<table>
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<tr>
<th>Description</th>
<th>Lab Location</th>
<th>Method</th>
<th>Preparation Method</th>
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</thead>
<tbody>
<tr>
<td>Mercury (CVAA) California - Waste Extraction Test with Citrate Leach</td>
<td>TAL SF</td>
<td>SW846 7470A</td>
<td>CA-WET CA WET Citrate</td>
</tr>
<tr>
<td>Preparation, Mercury</td>
<td>TAL SF</td>
<td>SW846 7470A</td>
<td></td>
</tr>
<tr>
<td>Mercury (CVAA) Preparation, Mercury</td>
<td>TAL SF</td>
<td>SW846 7471A</td>
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</tr>
</tbody>
</table>

**Lab References:**

TAL SF = TestAmerica San Francisco

**Method References:**

CA-WET = California Waste Extraction Test, from Title 22

## SAMPLE SUMMARY

Client: ERM-West  
Job Number: 720-26781-2

<table>
<thead>
<tr>
<th>Lab Sample ID</th>
<th>Client Sample ID</th>
<th>Client Matrix</th>
<th>Date/Time Sampled</th>
<th>Date/Time Received</th>
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</thead>
<tbody>
<tr>
<td>720-26781-30</td>
<td>WA-RT4-BR-04</td>
<td>Solid</td>
<td>03/18/2010 1515</td>
<td>03/22/2010 1800</td>
</tr>
</tbody>
</table>

TestAmerica San Francisco  
Page 5 of 18
Analytical Data

Client: ERM-West  
Job Number: 720-26781-2

Client Sample ID: WA-RT4-BR-04  
Lab Sample ID: 720-26781-30  
Client Matrix: Solid  
Date Sampled: 03/18/2010 1515  
Date Received: 03/22/2010 1800

### 7470A Mercury (CVAA)-STLC Citrate

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<tr>
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<th>DryWt Corrected: N</th>
<th>Result (mg/L)</th>
<th>Qualifier</th>
<th>RL</th>
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<tr>
<td>Mercury</td>
<td>ND</td>
<td>ND</td>
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<td>0.10</td>
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</table>

### 7471A Mercury (CVAA)

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<th>DryWt Corrected: N</th>
<th>Result (mg/Kg)</th>
<th>Qualifier</th>
<th>RL</th>
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<tbody>
<tr>
<td>Mercury</td>
<td>2.3</td>
<td>2.3</td>
<td></td>
<td>0.40</td>
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### DATA REPORTING QUALIFIERS

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## QC Association Summary

### Metals

<table>
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<th>Lab Sample ID</th>
<th>Client Sample ID</th>
<th>Report Basis</th>
<th>Client Matrix</th>
<th>Method</th>
<th>Prep Batch</th>
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</thead>
<tbody>
<tr>
<td>720-26781-30</td>
<td>WA-RT4-BR-04</td>
<td>C</td>
<td>Solid</td>
<td>CA WET Citrate</td>
<td></td>
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<tr>
<td>720-26781-30MS</td>
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<th>Client Matrix</th>
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<td>T</td>
<td>Water</td>
<td>7470A</td>
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<tr>
<td>MB 720-69618/1-A</td>
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<td>Water</td>
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<td>720-69618</td>
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<tr>
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<td>WA-RT4-BR-04</td>
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<td>Solid</td>
<td>7470A</td>
<td>720-69618</td>
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### Report Basis

- **C** = STLC Citrate
- **T** = Total

---

TestAmerica San Francisco
Quality Control Results

Client: ERM-West

Job Number: 720-26781-2

Method Blank - Batch: 720-69618

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Method: 7470A
Preparation: 7470A

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Lab Control Sample/
Lab Control Sample Duplicate Recovery Report - Batch: 720-69618

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<th>LCSD</th>
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<th>RPD</th>
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## Quality Control Results

**Job Number**: 720-26781-2

### Matrix Spike/
Matrix Spike Duplicate Recovery Report - Batch: 720-69618

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### Method: 7470A
Preparation: 7470A
STLC Citrate

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### STLC Citrate

#### Analyte: Mercury

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Quality Control Results

Client: ERM-West

Method Blank - Batch: 720-69537

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Prep Batch: 720-69537

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Initial Weight/Volume: 0.60 g
Final Weight/Volume: 50 mL

Analyte: Mercury

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Lab Control Sample/ Lab Control Sample Duplicate Recovery Report - Batch: 720-69537

LCS Lab Sample ID: LCS 720-69537/2-A

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Prep Batch: 720-69537

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Initial Weight/Volume: 0.60 g
Final Weight/Volume: 50 mL

Analyte: Mercury

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Method: 7471A
Preparation: 7471A

Instrument ID: LL_HG Analyzer
Lab File ID: N/A
Initial Weight/Volume: 0.60 g
Final Weight/Volume: 50 mL

LCSD Lab Sample ID: LCSD 720-69537/3-A
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**Project Info.**

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<th>Sample Receipt</th>
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<td>PO #:</td>
<td>Temp:</td>
</tr>
<tr>
<td>Credit Card #:</td>
<td>Conforms to record:</td>
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**Analysis Request**

1) Relinquished by:  
Signature:  
Time: 
2) Relinquished by:  
Signature:  
Time: 
3) Relinquished by:  
Signature:  
Time: 

**Sample Receipt**

1) Received by:  
Signature:  
Time: 
2) Received by:  
Signature:  
Time: 
3) Received by:  
Signature:  
Time: 

---

*Crush 1/2 material in bag, used crushed material for Total Hg, unexhasted for STLC test.

See Terms and Conditions on reverse.
### Sample Receipt

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<tbody>
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<td><strong>Project #:</strong></td>
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<td><strong>P.O.:</strong></td>
<td>Temp:</td>
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<td><strong>Credit Card #:</strong></td>
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<th>2 Day</th>
<th>1 Day</th>
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<table>
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<th>Level 4</th>
<th>EDD</th>
<th>State Tank Fund EDF</th>
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<table>
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<th>Global ID:</th>
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**1) Reinquished by:**
- **Signature:**
- **Time:**

**2) Reinquished by:**
- **Signature:**
- **Time:**

**3) Reinquished by:**
- **Signature:**
- **Time:**

**1) Received by:**
- **Signature:**
- **Time:**

**2) Received by:**
- **Signature:**
- **Time:**

**3) Received by:**
- **Signature:**
- **Time:**

See Terms and Conditions on reverse.

*TestAmerica SF reports 801 BM from Cu to Cu. Default for 801.56 to Cu to Cu*
**Analysis Request**

<table>
<thead>
<tr>
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**Sample Receipt**

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- [ ] 2) Relinquished by:
- [ ] 3) Relinquished by:

**Date** 3.22.10

**Reference #:**

**Number of Containers:** 2

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<td>1220 Quarz Way, Pleasanton, CA 94588</td>
</tr>
<tr>
<td>Phone: (925) 48-1820, Fax: (925) 48-3072</td>
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**Report To**

- **Attn:** Mike Arnold
- **Company:** ERM
- **Address:** 415 118th Ave. SE, Suite 130, Bellevue, WA
- **Phone:** 425-462-8591
- **Email:** mike.arnold@erm.com

**Sample Request**

- **Sample ID:** CH-WR-C1, CH-CO-01
- **Sample Date:** 3/19/10
- **Sample Time:** 1455
- **Sample Mat:** none
- **Sample Pres:** none

**Analysis Request**

- **Test Method:** EPA 601, 602, 608, 8260, 8270
- **Sample Method:** EPA 8015, 8020, 8260, 8270
- **Sample Number:** 1

**Project Info**

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- **# of Containers:**
- **Head Space:**
- **Temp:**
- **Conforms to record:**

**Sample Receipt**

- **Received by:**
  - **Signature:**
  - **Time:**
- **Printed Name:**
- **Date:**
- **Company:**

**Received by:**

- **Signature:**
- **Time:**
- **Printed Name:**
- **Date:**
- **Company:**

**Received by:**

- **Signature:**
- **Time:**
- **Printed Name:**
- **Date:**
- **Company:**

---

**Notes:**

- Do not use mercury
- Do not use uncrushed material
- Do not use SFE for mercury

---

**References:**

- TestAmerica 82 Report 82-908M from C1-C9 (industry norm). Default for 8015 is C1-C9.
Sharma, Dimple

From: Mike Arnold [Mike.Arnold@erm.com]
Sent: Wednesday, March 24, 2010 3:30 PM
To: Sharma, Dimple
Cc: Laura Tesch; Jennifer Barrett; Sarah Piper; hardrockgeo@yahoo.com
Subject: RE: Additional analyses for ERM 3/22/10 samples

Dimple,

Please also include the following analyses:

Page 1 of 4:
MA-WR-C3 - pH and total sulfides (USEPA 9034)

Thanks!
Mike

A. Michael Arnold, R.G., R.H.G.
Senior Project Manager
ERM
915 118th Avenue S.E., Suite 130
Bellevue, WA 98005

Office: +1 425 462 8591 x4004
Direct: +1 425 214 0454
Fax: +1 425 455 3573
Cell: +1 425 761 2603
mike.arnold@erm.com
www.erm.com

From: Mike Arnold
Sent: Wednesday, March 24, 2010 1:37 PM
To: 'dimple.sharma@testamericainc.com'
Cc: Laura Tesch; Jennifer Barrett; Sarah Piper; 'hardrockgeo@yahoo.com'
Subject: Additional analyses for ERM 3/22/10 samples

Dimple,

Please add the following analyses for the samples marked as "hold" on the attached chains of custody:

Page 1 of 4:
MA-WR-C3 - STLC Mercury by CalWET

Page 2 of 4:
WA-RT5-BR-05 - Total mercury by USEPA 7471A and STLC Mercury by CalWET
WA-RT5-ASH-02 - STLC Mercury by CalWET

3/24/2010
WA-RT5-ASH-03 - No analyses
WA-RT5-BR-06 - No analyses
WA-RT6-BR-07 - Total mercury by USEPA 7471A and STLC Mercury by CalWET
WA-RT6-BR-08 - Total mercury by USEPA 7471A and STLC Mercury by CalWET
WA-CT-C4 - STLC Mercury by CalWET
CE-CT-C2 - STLC Mercury by CalWET

Page 3 of 4:
WA-RT2-BR-2 - Total mercury by USEPA 7471A and STLC Mercury by CalWET

When the analyses are complete, please send the results to me and to the people indicated in the "cc" to this email.

Thanks!
Mike

A. Michael Arnold, R.G., R.H.G.
Senior Project Manager
ERM
915 118th Avenue S.E., Suite 130
Bellevue, WA 98005

Office: +1 425 462 8591 x4004
Direct: +1 425 214 0454
Fax: +1 425 455 3573
Cell: +1 425 761 2603
mike.arnold@erm.com
www.erm.com

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Please visit ERM's web site: http://www.erm.com
## Login Sample Receipt Check List

**Client:** ERM-West

**Login Number:** 26781

**Creator:** Hoang, Julie

**List Source:** TestAmerica San Francisco

**List Number:** 1

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<tr>
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Appendix E
Site Photographs
Photograph: E-1  West End Mine waste rock/native soil interface.

Homestake Mining Company of California  ERM  Colusa County, California

Photograph: E-2  Wide Awake Mine Lower Dump waste rock/native alluvium interface. The white cobble is native silicified-channel rock from up gradient.

Homestake Mining Company of California  ERM  Colusa County, California
Photograph: E-3  Wide Awake Mine lower dump waste rock/native alluvium interface.

Homestake Mining Company of California  ERM  Colusa County, California
Appendix F
Vegetation Restoration Plan
APPENDIX F

Draft Vegetation Restoration Plan for Wide Awake and Central Area Mines

Prepared for:
Homestake Mining Company of California

Sulphur Creek Mining District
Colusa County, CA

September 2010

www.erm.com
Draft Vegetation Restoration Plan for Wide Awake and Central Area Mines

Sulphur Creek Mining District
Colusa County, CA

September 2010

Project No. 0116443

DRAFT
Laura A. Tesch
Program Director

DRAFT
Mark Shibata
Senior Ecologist

DRAFT
Sarah Piper
Project Biologist

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Bellevue, Washington 98005
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1.0 INTRODUCTION

The Central Valley Regional Water Quality Control Board (CVRWQCB) issued Technical and Monitoring Report Orders R5-2010-0048 and R5-2010-0049 (Orders)\(^1\), which require the submittal of a Mining Waste Characterization Work Plan (Characterization Plan) and a Mining Waste Characterization Report (Characterization Report) for the Wide Awake Mine and five mines within the Central Mine Group (Central, Cherry Hill, Empire, Manzanita, and West End). The Orders were issued by the CVRWQCB based on provisions of California Water Code Section 13267. The six mines addressed by the Orders are located within the Sulphur Creek Mining District (the District), and for purposes of this document, these six mines are collectively referred to as “the Site”\(^2\).

The Orders were issued to several Potentially Responsible Parties, including Homestake Mining Company of California (Homestake), which are referred to as Dischargers in the Orders. The CVRWQCB has recognized that Homestake did not engage in any of the mining activities that resulted in the mining materials that are being addressed by the Orders.

On behalf of Homestake, Environmental Resources Management, Inc (ERM) prepared this Vegetation Restoration Plan (Revegetation Plan) for the following mine sites:

- Wide Awake Mine; and
- Central Group Mine Area (Central, West End, Cherry Hill, Manzanita, and Empire mines\(^3\)).

These mine areas are located within the Sulphur Creek Mining District (District), Colusa County.

---

\(^1\) Both dated May 27, 2010

\(^2\) The Site includes a cumulative area of about 465 acres within the Sulphur Creek watershed in Colusa County, and is located in Sections 28 and 29, Township 14 North, Range 5 West, Mount Diablo Base and Meridian. The specific parcel numbers included within the Site are listed on the Orders.

\(^3\) Since no reclamation is required at the Empire mine area (see Work Plan), there are no revegetation plans for the Empire mine area.
The purpose of this Revegetation Plan is to supplement the *Mining-Related Materials Characterization and Remediation Work Plan* (ERM 2010) (Remediation Work Plan) and describes the approach, scope, and specific protocols for introducing vegetation to (a) control soil erosion and (b) promote the future succession of plant communities at these sites.

### 1.1 RECENT AGREEMENTS

During a meeting on 11 August 2010 between Homestake and the CVRWQCB, the two parties discussed CVRWQCB comments on the Draft Work Plan (dated April 2010). Based on that discussion, Homestake agreed to prepare this Revegetation Plan for the Site.

As agreed between Homestake and the CVRWQCB, Homestake is responsible for the initial broadcast seeding of early succession stage herbaceous grasses and/or forbs. Plans after Year 1 of the initial broadcast seeding (including any applicable permit conditions) would be the responsibility of the other Dischargers. Accordingly, this Revegetation Plan focuses on Year 1, *Seeding of Early Succession Herbaceous Grasses and/or Forbs.*

As underlying substrate and slope of areas following reclamation cannot be accurately defined at this time, the Revegetation Plan will be supplemented following completion of restoration efforts at each mine site. Accordingly, this plan describes features and general principles in response to requests from the CVRWQCB. Activities described in this Revegetation Plan will be conducted in accordance with applicable agreements reached between Homestake and the CVRWQCB, and applicable state and local guidelines.
1.2 **ENVIRONMENTAL SETTING**

This section is intended to provide the environmental context for mine areas slated for vegetation restoration as described in this Plan. Hence, this section provides a brief description of the general environmental setting found within the District. Setting attributes include location, geology, hydrogeology, and land use and mining history. A more detailed description of the environmental setting can be found in the *Mining-Related Materials Characterization and Remediation Work Plan* (ERM 2010).

1.2.1 **Location**

The Sulphur Creek Mining District encompasses an area of about 22 square miles. This area includes the Sulphur Creek watershed and adjoining portions of the Bear Creek watershed to the north in Colusa County and the Harley Gulch watershed to the south located in Lake County (see Figure 2-1 of the Remediation Work Plan).

The Sulphur Creek watershed is located within the eastern side of the Coast Range geomorphic province of California, about 8 miles west of the western margin of California’s central valley and approximately 20 miles west of Williams, California (see Figure 2-2 of Remediation Work Plan). Sulphur Creek is an intermittent stream with continuous flows between the fall and spring months (October through June). Stretches of the stream are wet throughout the year because of inputs from geothermal springs (CVRWQCB 2007a). Sulphur Creek is a tributary within the larger, 6,543-acre, Cache Creek watershed that drains into the Yolo Bypass.

**Figure 2-3** of the Remediation Work Plan is a site map showing the locations of the mine sites addressed in this Revegetation Plan:

- Wide Awake mine;
- Central mine,
- West End mine,
- Cherry Hill mine, and
• Manzanita mine.\(^4\)

1.2.2 Geology

The Sulphur Creek watershed is located in the northern California Coast Range near the Coast Range Thrust Fault. The Coast Range Thrust pushed a thick sheet of mostly sedimentary rocks (the Great Valley sequence) over the metamorphic rocks of the Franciscan complex. Numerous faults underlie the area surrounding Sulphur Creek. The eastern edge of the Stony Creek Thrust is slightly north of Sulphur Creek. The western end of the Resort Fault Zone is located within the Sulphur Creek watershed. The Resort Fault Zone is 2 kilometers wide and consists of numerous straight, steep-dipping faults that offset the Coast Range ophiolite and Great Valley sequence (McLaughlin 1990). Common lithologies in the area include detrital serpentines, sandstone, and mudstone. Figure 2-4 of the Remediation Work Plan is a geological map of the District.

1.2.3 Hydrology

The District is divided into three watersheds: Harley Gulch, Sulphur Creek, and Bear Creek. There are no water wells reported within 1 mile of the District (California Department of Water Resources database), thus little information is available pertaining to the hydrogeology surrounding Harley Gulch, Sulphur Creek, and Bear Creek.

Groundwater beneath the District is primarily hydrothermal. The U.S. Geological Survey (USGS) has mapped numerous hot springs discharging in the area (Barnes \textit{et al.}, 1975). A shallow magma chamber beneath the Geysers-Clear Lake area is the most likely source of geothermal activity and springs in the Sulphur Creek watershed. The local concentrated fractures in the area, particularly cross-cutting structures, have likely focused increased hydrothermal convection from a magma heat source under the area. The detrital serpentines within and below the Great Valley sequence may channel hydrothermal solutions. Geothermal springs discharging to Sulphur Creek include the Jones Fountain of Life, Blanck Springs, Elbow Springs, Elgin Spring, and the Wilbur Hot Springs.

\(^4\) Note that no reclamation is required at the Empire mine area (see Remediation Work Plan). Accordingly, there are no vegetation restoration plans for the Empire mine area.
Several unnamed hydrothermal springs emanating from the bed are also likely to contribute to Sulphur Creek (Tetra Tech 2003). Figure 2-5 of the Remediation Work Plan shows the locations of wetlands in the area and Figure 2-6 of the Remediation Work Plan shows the locations of geothermal springs.

### 1.2.4 Land Use and Mining History

Land use within the District is predominantly rangeland in undeveloped chaparral and California scrub oak (Foe and Croyle 1998). Part of the Sulphur Creek watershed is privately owned and cattle graze on some private property in the lower watershed. The U.S. Bureau of Land Management (USBLM) administrates public land in the upper portion of the watershed and is the largest land owner in the District. The Wilbur Hot Springs resort is located about 1-1/3 miles northeast of Harley Gulch. Figure 2-8 of the Remediation Work Plan shows land ownership in the area.

There are no year-round residences in the watershed, except those associated with the Wilbur Hot Springs resort (CVRWQCB 2007a). The nearest community to the District is the town of Williams about 24 miles to the east.

Mining and mining-related processing began in the District approximately 140 years ago. Numerous mines were developed for mercury and/or gold between the 1860s and 1970s (described in greater detail in Churchill and Clinkenbeard 2003). Mines of interest for this Plan include the Wide Awake Mine and mines in the Central Mine Area (Figure 2-3 of the Remediation Work Plan).

### 1.3 DOCUMENT ORGANIZATION

This Revegetation Plan document is organized as follows:

- Section 2 – describes the purpose and scope of the vegetation restoration and reviews the restoration strategy;
- Section 3 – describes specific vegetation restoration activities on a site-by-site basis; and
- Section 4 – provides a list of literature cited.
Supplemental information is provided in the following two attachments:

- Attachment A – provides suggested revegetation monitoring and performance goals (as requested by the CVRWQCB) for post-Year 1 vegetation restoration efforts; and

- Attachment B – provides photographs of the areas slated for the Year 1 initial broadcast seeding.
2.0 VEGETATION RESTORATION PLAN

The goal of this Revegetation Plan is to introduce early succession stage vegetation that will (a) control soil erosion and (b) promote future succession of plant communities at the identified mine sites. As underlying substrate and slope of areas following remediation cannot be accurately determined at this time, the Revegetation Plan will be supplemented following completion of restoration efforts at each mine site. It should also be noted that various permits may include conditions related to the revegetation activities and as such, this plan may need to be revised to incorporate applicable permit conditions upon receipt of permit approvals. Accordingly, this section describes plan features and general principles in response to requests from the CVRWQCB.

Key features of the Plan that will be discussed in this section include:

- Phased approach;
- Location and areal extent;
- Seed mixes;
- Seeding schedule;
- Evaluate the effectiveness of the restoration against performance-based goals; and
- Monitor to verify the effectiveness of the restoration.

As agreed between Homestake and the CVRWQCB, Homestake is responsible for the initial broadcast seeding of early succession stage herbaceous grasses and/or forbs. Accordingly, this Plan focuses on Year 1, Seeding of Early Succession Herbaceous Grasses and/or Forbs (see Section 2.1). A summary of Year 1 Plan features is provided in Table 2-1.

Planning and implementation of subsequent phases of the vegetation restoration effort is the responsibility of the other named Dischargers.5

5 At the request of CVRWQCB, considerations for subsequent phases of the vegetation restoration effort at mine sites are provided in Attachment A.
2.1 PHASED APPROACH

To promote adaptive management, a phased vegetation restoration approach will be used. A phased approach has the following advantages:

- Provides opportunities for regular input and direction by decision-makers;
- Provides a logical, stepwise approach for compiling and analyzing more site-specific information;
- Provides opportunities to streamline and focus the restoration effort at each phase; and
- Provides opportunities to eliminate from further consideration areas where restoration goals have been achieved, thereby focusing on those areas requiring additional attention.

Year 1 (the first phase) of the Revegetation Plan implements the introduction/broadcast seeding of early succession herbaceous grasses and/or forbs to control erosion in reclaimed areas (Figure 2-1). Subsequent phases of the Revegetation Plan may include:

- Year 2: Increase cover of early succession stage herbaceous grasses and/or forbs.
- Year 3: Seed/transplant woody plants/shrub species that provide cover and forage for wildlife.
- Year 5: Increase yield/cover/diversity of mid-succession stage plant communities.

A decision point exists at the conclusion of each phase of the Plan, when it is imperative to decide:

1. Whether or not the restoration effort, in its current state, meets performance-based goals; or

---

6 As agreed with the CVRWQCB, Homestake’s responsibility is confined to Year 1 of the Plan. This document acknowledges that there may be subsequent phases of the Plan. As acknowledged by the CVRWQCB, these subsequent phases of the Plan are the responsibility of the other Dischargers. At the request of the CVRWQCB, considerations for subsequent phases of the Plan are presented in Appendix A.
2. If the restoration effort is determined to be incomplete, whether or not refinement of the current phase or progression to the next phase would provide a sufficient benefit to warrant the additional effort.

2.2 YEAR 1 LOCATION AND AREAL EXTENT

The location and areal extent of Year 1 vegetation restoration efforts are specified on a mine-by-mine basis in Section 3 of this Plan and are focused on post-reclamation areas at and access to:

- Wide Awake mine;
- Central mine;
- West End mine;
- Cherry Hill mine; and
- Manzanita mine.

Maps of areas within the Site slated for Year 1 restoration activities are provided in Section 3. The spatial extent of future phases of vegetation restoration may be further focused based on the performance of the vegetation restoration effort.

A part-time residence is located within the former Empire mine area. The waste rock pile appeared to be capped with topsoil, and there is no evidence of erosion (or a threat of erosion) of mining-related material into Sulphur Creek at this location. Thus, no reclamation activities are planned by Homestake for the Empire mine area. Since reclamation activities will not be conducted, no Year 1 vegetation restoration actions are proposed at the Empire mine.

---

7 Areas with rocky outcrops and exposed bedrock will not be re-vegetated given the lack of growth substrate.
2.3 YEAR 1 SEED MIXES

2.3.1 Native Plants

There has been an increased interest in the preservation and restoration of native plant communities by both natural resource trustees and the general public. In an effort to promote sustainable plant communities, Homestake will preferentially use seed mixes comprised of native grasses and/or forbs, where appropriate and applicable. The preferential use of native plants is made in light of the fact that previous restoration efforts in nearby areas found that seeding/introduction of native plants species rarely resulted in the establishment of native plant communities (Thomsen; Homestake 2001). Weedy non-native grasses and forbs dominate much of the surrounding landscape and, in many cases, will out-compete native species.

In general, native plants require the same care in installation as do non-native plants and are valued for their economic, ecological, and/or aesthetic benefits as well as the growing societal belief in their intrinsic value as living species including, but not limited to (Dorner and Brown 2000):

- Adding beauty to the landscape;
- Requiring very little long-term maintenance if properly planted and established;
- Aiding in controlling soil erosion; and
- Providing habitat and forage for wildlife.

Accordingly, where the capability to reduce soil erosion is comparable, Year 1 seed mixes comprised of native plants will be preferred over seed mixes comprised of non-native plants and used in Year 1 restoration efforts at areas that are deemed likely to support successful vegetation of native mixes.

Non-native plant species will be used when:

- Non-native plants provide a substantial improvement of soil erosion control over native species;
- Native plants are not available; or
- Use of native plants is not feasible.
If non-native plants are selected, sterile and/or short-lived plants shall be used that are best-suited for the area and that will control soil erosion.

### 2.3.2 Seed Mixes

Habitat types/plant communities observed at the Site include:

- Annual grassland,
- Valley oak woodland,
- Mixed chaparral,
- Valley foothill riparian, and
- Wetland.

Seed mixes comprised of native plant seeds that are compatible with the habitat type observed/anticipated at reclaimed areas will be used in Year 1 restoration efforts. For example, a seed mix comprised of early succession stage grasses and/or forbs characteristic of mixed chaparral will be used to seed reclaimed areas previous supporting mixed chaparral. A qualified revegetation specialist\(^8\) will determine the appropriate seed mix (plant species and relative proportion of seeds) for each area at the Site.

Preliminary seed mixes by habitat type are provided in **Table 2-2**. At the recommendation by Dr. Paul Aigner (UC Davis Co-Manager of McLaughlin Reserve), the actual composition of seed mixes by habitat type will be specified following completion of reclamation. Using a mix of species with slightly different requirements will encourage overall success because the expectation is that only one or two species will come to dominate a particular area. Concurrence by regulatory agencies for seed mixes will be obtained before the Year 1 vegetation restoration effort is initiated.

---

\(^8\) A *revegetation specialist* will have a background in botany, ecology, soil science, biology, or other related areas of study and a minimum of 5 years experience.
Table 2.2. Preliminary Year 1 Native and Non-Native Seed Mixes

<table>
<thead>
<tr>
<th>Habitat Type</th>
<th>Year 1 Seed Mix¹</th>
<th>Native Plant Mix</th>
<th>Non-Native Plant Mix</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual Grassland</td>
<td></td>
<td>Blue wildrye</td>
<td>Blando brome</td>
</tr>
<tr>
<td></td>
<td></td>
<td>California barley</td>
<td>Wilton rose clover</td>
</tr>
<tr>
<td></td>
<td></td>
<td>California onion grass</td>
<td>Berber orchard grass</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Purple needlegrass</td>
<td>Annual ryegrass</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pine bluegrass</td>
<td>Alta tall fescue</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Three week fescue</td>
<td>Intermediate wheat grass</td>
</tr>
<tr>
<td>Valley Oak Woodland</td>
<td></td>
<td>See Annual Grassland</td>
<td>See Annual Grassland</td>
</tr>
<tr>
<td>Mixed Chaparral</td>
<td></td>
<td>To Be Determined¹</td>
<td>Blando brome</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Wilton rose clover</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Alta tall fescue</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Panoche red brome</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Intermediate wheat grass</td>
</tr>
<tr>
<td>Valley Foothill Riparian²</td>
<td></td>
<td>Ambrosia</td>
<td>To Be Determined¹²</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Creeping wildrye</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mugwort</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrow-leaf goldenrod</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wild grape</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Saltgrass</td>
<td></td>
</tr>
<tr>
<td>Wetland</td>
<td></td>
<td>To Be Determined¹</td>
<td>To Be Determined¹</td>
</tr>
</tbody>
</table>

Notes:
1. Preliminary seed mixes based on discussions with Dr. Paul Aigner (UC Davis/McLaughlin Reserve Co-Manager). The actual composition of habitat-specific seed mixes will be determined prior to completing reclamation activities and agency approval will be sought by Homestake before initiating vegetation restoration.
2. Rhizomatous plant species will be considered (Thomsen).

Native plants with the following attributes will be considered:

- Appropriate to the Site;
- Locally collected and commercially available;
- Adapted for stabilization of critical areas where erosion control is paramount;
- Adapted to the climatic regime and soil moisture conditions likely to prevail at the site;
- Having low establishment requirements;
- Having high propagation success potential; and
• Having value to wildlife.

The selection of appropriate plant species, including some hardy metal and salt tolerant plant species (e.g., saltgrass) in the re-vegetation seed mixture, are intended to enhance the long-term effectiveness of the restoration effort.9

2.4 YEAR 1 SEEDING SCHEDULE

The Year 1 seeding of herbaceous grasses and/or forbs will occur following completion of reclamation efforts at each area. Year 1 broadcast seeding will be scheduled at a time that ensures the greatest probability of germination, growth, and maximal cover during the first growing season following reclamation.

It is expected that the initial time period of the Year 1 seeding effort will occur during the fall season prior to the winter rains.10

2.5 EVALUATE THE EFFECTIVENESS OF RESTORATION AGAINST PERFORMANCE-BASED GOALS

Performance-based goals (or triggers) specify the desired or expected vegetation at a defined point in time after implementation of the vegetation restoration effort and are standards against which to evaluate the effectiveness/progress of the restoration effort. Given that data are sufficient, these triggers are used to evaluate whether to proceed to the next phase or exit the restoration effort.

Year 1 metrics include visual observations of:

• Soil erosion—e.g., gullies, slumps, accumulation of soils in lower portions of areas;


10 A qualified revegetation specialist may be consulted upon completion of remediation activities.
• Plant cover (both native and non-native grasses and forbs); and
• Evidence of potential confounding factors—e.g., grazing pressure (by wildlife/cattle), competing invasive plants, and/or disease.

Observed presence of gullies, slumps, and accumulation of soils in lower portions of areas are a direct indicator of soil erosion. Plant cover was selected because it is considered a strong indicator of soil erosion control (Singer et al 1990; Zuazo and Pleguezuelo 2009). Noting unseasonal climatic conditions (e.g., high/low precipitation, temperature) and in-field observations of potential confounding factors will be used to qualify progress/achievement of Year 1 goals.

Year 1 performance-based plant cover triggers are presented in Table 2-3. Given recent observations and based on past experience, conditions at reclaimed areas that are anticipated to influence Year 1 restoration performance include, but are not limited to:

- Restoration habitat type;
- Substrate type (e.g., bedrock, gravel, sands);
- Presence/depth of topsoil; and
- Slope.

Accordingly, Year 1 performance-based triggers are stratified by the above attributes.

Table 2-3. Year 1 Performance-Based Plant Cover Goals/Triggers

<table>
<thead>
<tr>
<th>Substrate Type</th>
<th>Restoration Habitat Type</th>
<th>Slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topsoil (&gt; 1ft bgs)</td>
<td>Bedrock</td>
<td>All</td>
</tr>
<tr>
<td>Bedrock</td>
<td>Valley Annual Grassland</td>
<td>To Be Determined</td>
</tr>
<tr>
<td></td>
<td>Valley Oak Woodland</td>
<td>To Be Determined</td>
</tr>
<tr>
<td></td>
<td>Foothill Riparian</td>
<td>To Be Determined</td>
</tr>
<tr>
<td></td>
<td>Mixed Chaparral</td>
<td>To Be Determined</td>
</tr>
<tr>
<td></td>
<td>Wetland</td>
<td>To Be Determined</td>
</tr>
<tr>
<td>Restoration Habitat Type</td>
<td>Slope</td>
<td></td>
</tr>
<tr>
<td>-------------------------</td>
<td>----------</td>
<td></td>
</tr>
<tr>
<td>steep</td>
<td>flat</td>
<td></td>
</tr>
</tbody>
</table>

Notes:
- NA = not applicable (given insufficient topsoil, no seeding of grasses/forbs is proposed)
- steep = ≥ 5% grade
- flat = < 5% grade

The Year 1 decision framework is shown in Figure 2-1. Based on Year 1 verification monitoring data for a particular area (see Section 2.6), if the Year 1 performance-based triggers are:

- Achieved — then Year 1 restoration actions are complete and no further Year 1 restoration actions are necessary.
- Not achieved — then additional seeding effort using herbaceous grasses and/or forbs will be conducted.

### 2.6 MONITOR TO VERIFY THE EFFECTIVENESS OF RESTORATION

The purpose of the monitoring program is to obtain information to verify the effectiveness/progress and, ultimately, the success of restoration efforts at the Site. The Year 1 verification monitoring activities will occur at the end of the first growing season (e.g. end of spring season (2012) following the initial seeding in the fall of 2011) and will consist of inspections of reclaimed areas to evaluate plant cover. The monitoring activities include:

- Randomly selecting sampling locations within restoration areas\(^{11}\)
- A 10-cm by 10-cm quadrat will be randomly placed at each sampling location
- A photograph of plant cover within each 10-cm by 10-cm quadrat will be taken
- Percent plant cover will be calculated from photographs
- Visual observations by a qualified botanist will be recorded
- Those areas with evidence of active erosion (e.g., gullies, slumping) will be graded and seeded

\(^{11}\) The number sampling locations at each mine will be determined following the completion of the remediation effort, once the areal extent of remediation is known.
Visual observations of evidence of soil erosion and plant cover at reclaimed areas will be compared to Year 1 performance-based goals qualified by any observed confounding factors to evaluate the effectiveness/progress of restoration efforts. If Year 1 performance goals are not met after the first growing season monitoring event (Figure 2-1), vegetation restoration progress will be monitored at the end of the second fall season (2012). Plant cover will be evaluated as described above.

At the end of the first fall season (2011), Homestake will prepare a summary of the initial restoration activities and Year 1 revegetation status. Revegetation activities and monitoring becomes the responsibility of the other Dischargers after the performance goal has been met.
3.0 VEGETATION RESTORATION PLAN ACTIVITIES

The Site currently supports habitat types typical for the general region in which they are located. The serpentine substrate in many areas supports mixed chaparral, which gives way to valley oak woodland and annual grassland in most areas at the Wide Awake and Central Area mines. Valley foothill riparian and wetland habitat also exists near Sulphur Creek and its tributaries. Actions will be taken to revegetate the mine areas and access ways with seed mixtures that are consistent with and intended to re-establish the habitat types currently found at/surrounding areas slated for reclamation. The habitats currently found at the Site are presented in Figure 3-1.

The nature of the substrate beneath the waste planned for removal at some of the mines is uncertain. It will therefore be necessary to plan the revegetation in such a way that it is understood that bedrock areas will not be revegetated, and areas with steep slopes (>5%) may need to be planted with non-native plants for greater erosion control.

Habitat types currently present at or near each of the areas to be reclaimed and planned access ways are presented below in Table 3-1. Figure 3-1 depicts the seed mixtures likely to be used in reclaimed areas/access ways at mine sites.

Table 3-1. Habitat Types Currently Present at Mine Sites

<table>
<thead>
<tr>
<th>Mine</th>
<th>Annual Grassland</th>
<th>Oak Woodland</th>
<th>Foothill Riparian</th>
<th>Mixed Chaparral</th>
<th>Wetland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wide Awake Mine</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Central Mine</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>West End Mine</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Cherry Hill Mine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Manzanita Mine</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

The following sections present further details related to revegetation at each mine site. These areas are subject to change based on conditions encountered in the field.
3.1 WIDE AWAKE MINE

The access to this mine will traverse through annual grassland, valley oak woodland, valley foothill riparian, and wetland habitats. Several sections of the access roads are already present and need minor upgrades, so minimal habitat disturbance is anticipated for access to the Wide Awake mine. The newly disturbed areas will be re-seeded with the appropriate seed mix once the access ways are no longer in use (Figure 3-2).

During reclamation activities, it is likely that the area will be stripped down to bedrock in some areas to remove mining-related material. Areas of exposed bedrock will not be revegetated due to the steep slopes and lack of potential for erosion. Areas with sufficient topsoil will be seeded with the appropriate seed mixture based on the pre-remediation habitat (Figure 3-2). To the extent possible, every effort will be made to minimally disturb the wetland and riparian areas. These areas will be regraded, where necessary, and re-seeded with the appropriate mixture (Figure 3-2).

3.2 CENTRAL MINE

Access to the Central Mine is gained from the Manzanita mine. The access road will traverse through valley oak woodland, a small wetland, and annual grassland. These areas will be re-seeded with the appropriate seed mix once the access way is no longer in use (Figure 3-2).

The mining-related material at the Central Mine will be regraded and managed in place. These areas will be re-seeded with a mix of annual grassland and mixed chaparral, depending on the final slope and pre-reclaimed conditions (Figure 3-2).

3.3 WEST END MINE

The access to the West End mine will traverse through annual grassland, valley foothill riparian, and wetland habitats. These areas will be re-seeded with the appropriate seed mix once the access way is no longer in use (Figure 3-2).

During reclamation activities, it is likely that the area will be stripped down to bedrock to remove mining-related materials. Areas of exposed
bedrock will not be revegetated due to the steep slopes and lack of potential for soil erosion. Areas with sufficient topsoil will be seeded with the mixed chaparral mixture (Figure 3-2).

3.4 CHERRY HILL MINE

The access to the Cherry Hill mine is from an existing developed road. No new areas will need to be disturbed to gain access, and therefore no access ways will be reseeded in relation to this mine site.

During reclamation activities, it is likely that the area will be stripped down to bedrock to remove all mining-related material. Areas stripped down to bedrock will not be revegetated due to the steep slopes and lack of potential for erosion. Areas with sufficient topsoil will be seeded with the mixed chaparral mixture (Figure 3-2).

3.5 MANZANITA MINE

The access to the Manzanita Mine traverses through annual grassland, valley foothill riparian, wetland, and mixed chaparral habitats. It will be necessary to cross over Sulphur Creek to gain access to this area. A temporary crossing will be used to access this area and will be removed following completion of reclamation activities. After removal, these areas will be regraded, where necessary, and re-seeded with the appropriate mixture (Figure 3-2). All other access ways will be reseeded upon completion of the project.

Due to the highly eroded slopes at this mine, some of the waste areas may be regraded and mining-related material managed in place. If necessary, riprap or other such engineering controls may be utilized to prevent erosion. Some areas may be stripped down to bedrock to remove mining-related material. Riprap areas and areas of exposed bedrock will not be revegetated due to the steep slopes, lack of topsoil, and minimal potential for soil erosion. Areas with sufficient topsoil will be seeded with the mixed chaparral mixture (Figure 3-2).
4.0 LITERATURE CITED


Thomsen, C. [no date]. Sulphur Creek Enhancement Project. Department of Plant Sciences. UC Davis and the American Land Conservancy.

Figures
Figure 2-1. Vegetation Restoration Plan Decision Framework

Homestake

Year 1
Seed Early Succession Grasses/Forbes

Year 1
Verification Monitoring

Meet Performance Goals?

N = 2

Exit

Other Named Dischargers

Year N
Restoration

Year N
Verification Monitoring

Meet Year N Performance Goal?

N ≤ 5 years?

N = N + 1

Exit Year N

Exit
Tables
Table 2-1. Overview of the Vegetation Restoration Plan: Year 1

<table>
<thead>
<tr>
<th>Areas of Interest</th>
<th>Wide Awake Mine</th>
<th>Central Mine</th>
<th>West End Mine</th>
<th>Cherry Hill Mine</th>
<th>Manzanita Mine</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>tailings/waste</td>
<td>access</td>
<td>tailings/waste</td>
<td>access</td>
<td>tailings/waste</td>
</tr>
<tr>
<td>Reas of Interest</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wide Awake Mine</td>
<td>tailings/waste</td>
<td>access</td>
<td>tailings/waste</td>
<td>access</td>
<td>tailings/waste</td>
</tr>
<tr>
<td>Central Mine</td>
<td>tailings/waste</td>
<td>access</td>
<td>tailings/waste</td>
<td>access</td>
<td>tailings/waste</td>
</tr>
<tr>
<td>West End Mine</td>
<td>tailings/waste</td>
<td>access</td>
<td>tailings/waste</td>
<td>access</td>
<td>tailings/waste</td>
</tr>
<tr>
<td>Cherry Hill Mine</td>
<td>tailings/waste</td>
<td>access</td>
<td>tailings/waste</td>
<td>access</td>
<td>tailings/waste</td>
</tr>
<tr>
<td>Manzanita Mine</td>
<td>tailings/waste</td>
<td>access</td>
<td>tailings/waste</td>
<td>access</td>
<td>tailings/waste</td>
</tr>
<tr>
<td>Program Objective</td>
<td>Introduce/seed herbaceous grasses/forbs to control soil erosion and promote future succession of plant communities.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Substrate</td>
<td>bedrock</td>
<td>topsoil</td>
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<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>Slope</td>
<td>steep (≥ 5% grade)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>flat (&lt; 5% grade)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Seed Mix</td>
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<td>TBD</td>
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<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>Performance-Based Goal</td>
<td>40% cover</td>
<td>40% cover</td>
<td>40% cover</td>
<td>40% cover</td>
<td>40% cover</td>
<td>40% cover</td>
<td>40% cover</td>
<td>40% cover</td>
<td>40% cover</td>
<td>40% cover</td>
</tr>
</tbody>
</table>

Notes:
1 Restoration Habitat Types = desired future habitat types
2 Progress/achievement of Year 1 performance-based triggers may be qualified to account for factors observed in the field, such as unanticipated climate (e.g., precipitation), grazing pressure (e.g., wildlife, cattle), competing invasive plants, and/or disease.

Legend:
AG = Annual Grassland
MC = Mixed Chaparral
VFR = Valley Foothill Riparian
VOW = Valley Oak Woodland
W = Wetland
Attachment A
Proposed Post-Year 1 Revegetation Plan
Considerations
A.1 INTRODUCTION

As agreed by Homestake and CVRWQCB, Homestake is responsible for planning and implementing Year 1 of the Vegetation Restoration Plan (Revegetation Plan). The other responsible Dischargers as identified by the CVRWQCB will be responsible for planning and implementing subsequent phases of the Revegetation Plan.

At the request of the CVRWQCB, considerations for subsequent phases of the Revegetation Plan were identified by Homestake.

A.2 POST-YEAR 1 PLANNING CONSIDERATIONS

Subsequent phases of the Revegetation Plan may include (Figure 2-1):

- **Year 2:** Increase cover of early succession stage herbaceous grasses and/or forbs, if needed.
- **Year 3:** Seed/transplant woody plants/shrub species that provide cover and forage for wildlife.
- **Year 5:** Demonstrate establishment of plant communities and/or Increase yield/cover/diversity of mid-succession stage plant communities.

Considerations related to effective planning of subsequent phases of the Revegetation Plan include:

- Revisit vegetation restoration objectives
- Revisit subsequent phases of restoration
  - Year 2: Increase cover of early succession stage herbaceous grasses and forbs, where and if needed
  - Year 3: Seed/transplant woody plants/shrub species that provide cover and forage for wildlife
  - Year 5: Demonstrate establishment of plant communities and/or Increase yield/cover/diversity of mid-succession stage plant communities
- Revisit the performance goals for each phase
  - percent vegetation cover
  - erosion control
- Identify target plants and requirements
- structure—workhorse/specialist species
- function—erosion control, weed control

- Identify limiting factors, including but not limited to:
  - topsoil: soil moisture, nutrients, organic content, salts, pH, stability
  - slope: steepness, surface roughness, length
  - non-native, invasive competitors
  - grazing pressure
  - disease

- Consider maintenance measures (treatments/amendments) that address/mitigate limiting factors

- Assess site resources
  - available topsoil
  - duff, litter, and other woody material

To adaptively manage vegetation restoration efforts, managers may contemplate these considerations at the conclusion of each phase of the Revegetation Plan.

A.3 POST-YEAR 1 IMPLEMENTATION-RELATED CONSIDERATIONS

Considerations related to implementation of subsequent phases of the Revegetation Plan include:

- Consider seeding/cuttings/transplants
- Install treatments/amendments
- Install plants
- Identify plant maintenance
- Scope verification monitoring
A.4 POST-YEAR 1 PERFORMANCE-BASED TRIGGERS AND REPORTING CONSIDERATIONS

It is recommended that all plantings should be monitored and maintained as suggested above for up to five years (Figure 2-1). Managers should consider performance-based triggers for each phase of the Revegetation Plan that may include, but are not limited to:

- After 3 years
  - no visible evidence of active soil erosion
  - 70% plant cover

- After 5 years
  - no visible evidence of active soil erosion
  - 75% plant cover

It is suggested that the performance-based triggers for subsequent phases of the Revegetation Plan be (a) proposed by the other responsible Dischargers\(^\text{12}\) and (b) approved by the appropriate agency prior to implementation.

If the cover requirements are not meeting performance-based triggers, the Agency should consider requiring the other responsible Dischargers to initiate replacement planting and/or other additional activities (e.g., soil amendments, watering, weeding, eradication of invasive nuisance plants) to achieve approved Plan goals.

In addition, it is also suggested that the other responsible Dischargers meet any and all permit conditions related to site restoration, erosion control, and maintenance and reporting requirements. For example, a minimum requirement is anticipated to include the submittal of a revegetation status report to the appropriate agency.

\(^{12}\) If needed, with the assistance of a qualified revegetation specialist.
Attachment B
Photographs/Photolog
1. View of annual grassland habitat near the West End Mine (spring)

2. View of annual grassland habitat near the West End Mine (winter)

3. View of wetland habitat near Wide Awake Mine.

4. View of wetland habitat near West End Mine.
4.5. View of riparian area near Wide Awake Mine.

6. View of Sulphur Creek riparian corridor near the West End Mine.

7. View of valley oak woodland habitat south of Wide Awake Mine.

8. View of mixed chaparral habitat at the Manzanita Mine.
Appendix G
Proposed Rockfill Sediment Dam
Design for Wide Awake
1 Introduction

Removal of the mining-related waste rock in the very bottom of the existing channel in the Wide Awake Mine area may be difficult and may result in some material trapped in inaccessible areas of the channel floor (among boulders and in pools and pockets along the channel floor). If the estimated volume trapped is sufficiently small, then no additional collection measures shall be deemed necessary. However, if the trapped volume is estimated to be greater than 20 cubic yards (see footnote in Section 4.4.4 of Work Plan), then a temporary rockfill sediment dam structure may be constructed and operated in the channel downstream of the waste rock piles to detain and facilitate the removal of the trapped materials over a period of up to five (5) years.

2 Preliminary Design Plan

The embankment for the sediment dam should be constructed of a porous riprap material to allow water to drain freely from within the embankment and to allow at least limited overtopping of the embankment during large storm events without breaching of the embankment and avoiding the construction of a separate spillway structure (see Figure 1). A one (1) ft thick layer of gravel and sand will be placed on the upstream slope of the embankment to help filter and detain water in the pool area of the sediment pond. During most storm events, the water level in the pool will be controlled using a 24-inch diameter vertical HDPE riser pipe connected to a 12 inch diameter HDPE outlet pipe. The overflow elevation of the riser inlet should be set to provide one (1) ft of freeboard to the top of the embankment. The riser inlet should be protected using a galvanized rod trash rack attached to the top of the riser with a galvanized steel strap (see Figure 2).

The pool area of the sediment pond should be configured for the easy removal of sediment. A dedicated access ramp having a minimum width of 12 ft and a maximum gradient of 15% should be constructed at an appropriate location in the pool area to provide access for equipment used to clean accumulated sediment from the pond. On the bank opposite the access ramp, a push wall will be constructed to facilitate the efficient loading and removal of sediment using an end loader (see Figure 3). The wall will consist of a gabion wall reaction block faced with a reinforced concrete wall for durability. Similarly, a 6-inch reinforced concrete slab apron will protect the soil in front of the wall from the forces of excavation.

Gabions shall be of a single unit construction. The base, ends, sides, and lid shall be either welded into a single unit or shall be connected in such a manner that strength and flexibility at the connection are at least equal to that of the wire
mesh. The gabions shall be fabricated in such a manner that they can be assembled at the construction site with spiral binders and connecting wire into rectangular baskets of the specified size. Rock for filling the gabions shall be not less than 4 inches nominal diameter. Rock may be obtained from any approved source. Lids shall be tied along the front, ends, and diaphragms of individual gabions and to successive gabions with 13.5-gage tie wire or with 9-gage spiral binders.

3 Maintenance and Monitoring

If the construction of the rockfill sediment dam is deemed warranted, Homestake will include this activity as part of the restoration activities. However, any inspections, maintenance and final removal will be the responsibility of other Dischargers, identified by CVRWQCB. It is expected that the CVRWQCB and other Dischargers will negotiate the terms of maintenance and monitoring of the sediment dam and pond.
Figures
Figure 1 – Rockfill Sediment Dam (Panel 1)

TYPICAL SECTION OF ROCKFILL SEDIMENT DAM AT RISER/OUTLET PIPING

NTS
Figure 2 - Rockfill Sediment Dam (Panel 2)

TYPICAL DETAILS FOR GALVANIZED STEEL ROD TRASHRACK WITH ANTIVORTEX BAFFLE (NTS)

### Typical Bend Pattern for Steel Rods

#### Table of Dimensions

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.88 x G</td>
</tr>
<tr>
<td>B</td>
<td>0.33 x G</td>
</tr>
<tr>
<td>C</td>
<td>0.33 x G</td>
</tr>
<tr>
<td>D</td>
<td>0.10 x G</td>
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<tr>
<td>E</td>
<td>0.05 x G</td>
</tr>
<tr>
<td>F</td>
<td>1.66 x G</td>
</tr>
<tr>
<td>G</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Note: All dimensions refer to inside edge of bars.

#### Side View

- Galvanized steel band/clamp
- Note: G = Outside Pipe Diameter. All other dimensions are relative to G.

#### Plan View

- Galvanized steel rod trashrack, 6 mm min. rod diameter or #3 epoxy-coated rebar
- Note: Trashrack requires 3 large rings with inside bar edge diameter of $F = F - 2x$ Bar Diameter, plus 1 medium ring of Diameter G and 1 small ring of Diameter G44. Rings to be welded on inside of bent rod cage.

#### Antivortex Baffle Plate

- Galvanized steel baffle plate, 9 mm min. plate thickness. Plate to be welded to the inside of the steel rod trashrack.

### Typical Section for Pipe Bedding

- Granular soil bedding
Figure 3 - Rockfill Sediment Dam (Panel 3)

TYPICAL DETAIL FOR PUSH WALL
NTS
PLAN VIEW

Gabion Wall

Reinforced Concrete Wall

Reinforced Concrete Slab

A

A'

30 ft

3 ft

3 ft

8 in

10 ft

SECTION AA'

Compacted Fill

Existing Slope

#4 Epoxy Coated Dowels @ 3 ft c/c

#6 bars @ 12 in c/c ea. way

#4 dowels @ 2 ft c/c

Welded Wire Fabric

Existing Ground